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Original Article

Physiotherapy Section

Influence of Ergonomic Breastfeeding on Risk of Developing Musculoskeletal Disorders on Lactating Mothers and Quality of Infant's Latch: A Quasi-experimental Study

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ABSTRACT

Introduction: Breastmilk is recognised as the best infant nutrition, but Exclusive Breastfeeding (EBF) rates remain as low as 63.7% in India and 48% worldwide. One barrier is the development of Musculoskeletal Disorders (MSDs) in postpartum mothers due to a lack of education on proper breastfeeding posture. These factors can impact the quality of the infant's latch, resulting in early cessation of breastfeeding.

Aim: This study aimed to assess the impact of ergonomic breastfeeding on the risk of developing MSD in lactating mothers and infant latch quality.

Materials and Methods: The present quasi-experimental study was conducted in SDM Hospital, Dharwad, Karnataka, India, from August 2022 to January 2024, involving 70 participants. Postpartum mothers were evaluated to determine if they met the inclusion criteria. Baseline information was gathered, including the assessment of infant mouth attachment and effective suckling using the World Health Organisation (WHO) B-R-E-A-S-T feed observation form and Rapid Upper Limb Assessment (RULA). Mothers received ergonomic education on the advisable breastfeeding position during each session. On the discharge day, the mothers were reassessed. Statistical methods such as the Chi-square test, Wilcoxon matched pair test, and Mann-Whitney U test were used, with significance set at a p-value of <0.05.

Results: Seventy lactating mothers participated, with a majority above 25 years 40 (57.14%) and multiparous 38 (54.3%). Cradle hold was the most preferred breastfeeding posture 56 (80%). Postintervention, significant improvements (73.23%) were noted in infant attachment and suckling scores (mean increase 5.47, p<0.0001) and maternal posture as per RULA scores for both right (2.41±1.47) and left side (2.54±1.39). No significant association was found with delivery type.

Conclusion: Ergonomic breastfeeding education reduces MSD risk and promotes effective infant latch. This highlights the essential role of physiotherapists in promoting effective breastfeeding ergonomics and preventing musculoskeletal issues in postpartum mothers, irrespective of the type of delivery or parity.

Keywords: Health education, Infant, Newborn, Postpartum period

INTRODUCTION

Breastmilk has always been recognised as the ideal nutrition for a newborn as it is uniquely formulated, making it the gold standard for newborn nourishment [1]. "EBF" is described as providing just breast milk and no other food or drink, not even water. It does, however, allow the new born to receive Oral Rehydration Solutions (ORS), drops, and syrups (vitamins, minerals, and medicines) [2]. Breastfeeding benefits both the newborn and the mother. It protects the baby from infectious diseases, promotes healthy development, and lowers the risk of conditions like asthma, Sudden Infant Death Syndrome (SIDS) and cancer [3-5]. For the mother, it helps with recovery, acts as a natural form of birth control, and lowers the risk of diseases such as ovarian and breast cancer, diabetes, and endometriosis [3]. Thus, several organisations such as ACOG, AAP, IYCF, WHO, and UNICEF recommend six months of EBF [6-9]. Despite the various benefits and recommendations associated with breastfeeding, the rates of EBF remain low. Only 48% infants worldwide and 63.7% infants in India are exclusively breastfed from birth to six months [10,11]. Despite the advancements, certain barriers such as a lack of education on prenatal care and the importance of breastfeeding, misconceptions surrounding breastfeeding, such as the belief that it is painful, cause breast sagging, or that exercise impacts the taste of milk and the need for a plain diet. Low maternal optimism and confidence in breastfeeding, improper practices such as early introduction of solid food, introduction of formula feed for non-medical reasons, lack of continued support after getting discharged from hospital, delayed intervention for breastfeeding difficulties, inability of the healthcare providers to dedicate enough time to every patient individually, pain due to C-section are often cited as barriers as well [12-16]. Musculoskeletal problems such as low back pain, sciatica, kyphosis, lordosis, scoliosis, carpal tunnel syndrome, brachial plexus pain, and mechanical neck discomfort are also major barriers. Both before and after the feeding session, poor posture might result in pain in various body parts. Fatigue in the hand muscles or repetitive use of the same hand position to support the baby's weight can be the cause. This pain can lead to compensatory changes in the neck, thoracic, or lumbar spine, affecting proper posture, and if left unaddressed, can result in long-term spinal deformities [17]. These can negatively impact the quality of latch, resulting in issues like improper sucking, blocked milk ducts, longer intervals between feeds, and cracked nipples; all of which can be managed by educating about early initiation of breastfeeding technique, hand expression technique, and relaxation technique to avoid complications such as engorgement, mastitis and abscess formation. Therefore, it is important to assess the mother's breastfeeding posture. Thus, this study aimed to determine the effect of ergonomic breastfeeding training to modify the risk of development of MSDs in lactating mothers and the infant's latch.

MATERIALS AND METHODS

The present quasi-experimental study was conducted in Dharwad, Karnataka, India, from August 2022 to January 2024. Following

Institutional Ethical Committee approval (IEC. No: 2021/Physiotherapy/MPT/01), Informed written consent was obtained from all recruited patients. The study focused on early postnatal women and their newborns receiving postnatal care at multi-speciality hospitals, who were randomly selected from day 0 to the day of discharge (approximately day 3-4).

Inclusion criteria:

- **Mothers:** over 18, primigravida, primiparous, or multiparous without prior knowledge of breastfeeding techniques, ability to understand instructions, willingness to continue breastfeeding, consent to participate in the study, and having a minimum RULA score of 3.
- **Newborn:** Normal birth weight

Exclusion criteria:

- **Mothers:** history of breast cancer or breast surgery, twin pregnancy, use of medication that affects breastfeeding or contraindicated for breastfeeding, use of sedating psychotherapeutic drugs, anti-epileptic drugs, or opioids causing side-effects such as drowsiness and respiratory depression, exposure to radioactive iodine 11, excessive use of topical iodine, cytotoxic chemotherapy, and health conditions such as severe illness (e.g., sepsis) or Herpes Simplex Virus type 1 (HSV-1) infection.
- **Infants:** In Neonatal Intensive Care Unit (NICU) or with health conditions such as classic galactosaemia, maple syrup urine disease, phenylketonuria, very low birth weight (less than 1500 g), <32 weeks of gestational age, at risk for hypoglycaemia, or congenital defects such as Down syndrome, cleft palate/lip, or congenital heart disease.

Sample size calculation: Based on the pilot study conducted on 10 samples, the sample size was calculated utilising the effect size (0.35) calculated from the preintervention and postintervention values for RULA using the Paired t-test. Considering a 5% dropout rate, the study's sample size was approximated to 69 and rounded off to 70. Due to the ongoing pandemic, the number of hospital stay days for patients with no postnatal complications was reduced to 3-4, as per the national policy [18].

Study Procedure

The study methodology involved collecting baseline information, including demographic details, medical history, obstetric history, and breastfeeding establishment details. Posture examination and breast examination were conducted to rule out any complications related to breast anatomy. After that, the women were observed during breastfeeding, and the WHO B-R-E-A-S-T Feed observation form was used to grade the latch [19]. The mothers with a RULA score of 3 or above (the scale suggests that individuals with scores 1 to 2 demonstrate acceptable posture, which does not require further intervention) [20] were included in the study and received ergonomic training on breastfeeding positions and techniques. The training was provided by a physiotherapist with expertise in maternal health and musculoskeletal ergonomics. Three sessions were provided until the day of discharge, with emphasis on following ergonomic advice during each feeding session. The participants were reassessed on the day of discharge. These measures were recorded as preintervention scores on the baseline visit and as postintervention scores on the day of discharge.

STATISTICAL ANALYSIS

Data analysis was done using Statistical Package for Social Sciences (SPSS) 20.00 version. All calculations were performed at a 95% confidence interval. As the data did not have a normal distribution, non-parametric tests such as the Chi-square test, Wilcoxon matched pair test, and the Mann-Whitney U test were used with $p<0.05$ being considered statistically significant.

RESULTS

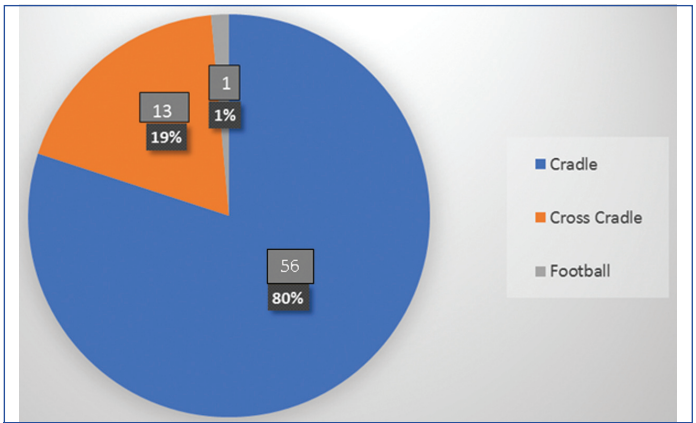
The study included 70 patients who met the inclusion criteria. The majority of women were above the age of 25 years, 40 (57.14%), mostly housewives, 62 (88.57%), and of normal Body Mass Index (BMI), 40 (57.14%) [Table/Fig-1]. The majority of women had undergone Lower Segment Cesarean Section (LSCS) 37 (52.9%) and were multiparous 38 (54.3%) [Table/Fig-2]. The participants' most preferred breastfeeding posture is the cradle posture by 56 (80%) women [Table/Fig-3].

Demographic profile	No. of respondents	% of respondents
Age groups (years)		
≤25	30	42.86
>25	40	57.14
Mean±SD	26.36±4.68	
Occupation		
Housewife	62	88.57
Nurse	5	7.14
Others	3	4.29
BMI		
Normal	40	57.14
Overweight	25	35.71
Obese	5	7.14
Mean±SD	24.78±3.13	
Total	70	100.00

[Table/Fig-1]: Demographic profile of patients using descriptive analysis.

	Parity					
Type of delivery	Primiparous	%	Multiparous	%	Total	%
Full-Term Vaginal Delivery (FTVD)	15	45.5	18	54.5	33	47.1
Lower Segment Cesarean Section (LSCS)	17	45.9	20	54.1	37	52.9
Total	32	45.7	38	54.3	70	100.00

[Table/Fig-2]: Type of delivery and parity-wise distribution using the Chi-square test. Chi-square=0.002, p=0.967



[Table/Fig-3]: Preferred breastfeeding posture and percentage of respondents for each type using descriptive analysis.

The results reported to have a significant difference between the mean values of FTVD (0.53) and LSCS (1.44) groups about breastmilk expression establishment. Out of the total 33 women who delivered normally, a majority of them, 32 (97.05%), established milk expression by day 1. Of 37 women who delivered via LSCS, the majority, 36 (97.20%), established milk expression by day 2 [Table/Fig-4]. The values report statistically significant comparison between the two modes of delivery, with a majority of women who delivered normally 32 (97.12%), establishing breastfeeding by day-1 and until day 2 for women who delivered via LSCS 31 (83.78%) and the remaining 16.22% women establishing feeding by day 3 of delivery [Table/Fig-5].

Days post-delivery	Parity								Total	
	FTVD multiparous		FTVD primiparous		LSCS multiparous		LSCS primiparous			
	n	%	n	%	n	%	n	%	n	%
0	10	55.6	7	46.7	2	10	1	5.9	20	28.6
1	8	44.4	7	46.7	13	65	7	41.2	35	50.0
2	0	0	1	6.7	5	25	8	47.1	14	20.0
3	0	0	0	0	0	0	1	5.9	1	1.4
Total	18	25.7	15	21.4	20	28.6	17	24.3	70	100

[Table/Fig-4]: Comparison of the type of delivery with the day of establishment of milk expression (post-delivery) using the Chi-square test.
Likelihood ration=30.62; p<0.001

Days post-delivery	Parity								Total	
	FTVD multiparous		FTVD primiparous		LSCS multiparous		LSCS primiparous			
	n	%	n	%	n	%	n	%	n	%
0	7	38.9	7	46.7	2	10	1	5.9	17	24.3
1	11	61.1	7	46.7	10	50	6	35.3	34	48.6
2	0	0	1	6.7	6	30	6	35.3	13	18.6
3	0	0	0	0	2	10	4	23.5	6	8.6
Total	18	25.7	15	21.4	20	28.6	17	24.3	70	100

[Table/Fig-5]: Comparisons of type of delivery with day of initiation of breastfeeding (post-delivery) using the Chi-square test.
Likelihood ration=30.68; p<0.001

In [Table/Fig-6], the preintervention mean score was 7.47. After the intervention, there was an average improvement of 5.47, resulting in a postintervention mean score of 12.94. This increase was statistically significant.

Variables	Intervention	Mean	SD	Mean Diff.	SD Diff.	% of change	z-value	p-value
Total	Preintervention	7.47	2.33	5.47	2.29	73.23	7.2713	0.0001*
	Postintervention	12.94	0.23					
Body position	Preintervention	3.11	1.37	3.84	1.35	123.39	7.2713	0.0001*
	Postintervention	6.96	0.2					
Attachment	Preintervention	2.8	0.96	0.91	0.9	32.65	5.6454	0.0001*
	Postintervention	3.71	0.46					
Effective suckling	Preintervention	1.67	0.53	0.33	0.56	19.66	3.797	0.0001*
	Postintervention	2	0.17					

[Table/Fig-6]: Comparison of preintervention and postintervention on the Grading system for infant's mouth attachment and effective suckling during breastfeeding scores using the Wilcoxon matched pair test.
*p<0.05

The intervention led to a statistically significant improvement (p<0.001) in infant breastfeeding technique. Postintervention, all infants achieved correct body positioning and mouth attachment, up from 20% and 60% respectively. Effective suckling rose from 67.14% to 98.57%, highlighting the intervention's success in enhancing feeding quality [Table/Fig-7]. For [Table/Fig-8], the results are statistically significant

Parameters		Preintervention	%	Postintervention	%
Correct body position	Poor	26	37.14	0	0.00
	Average	30	42.86	0	0.00
	Good	14	20.00	70	100.00
	Total	70	100.00	70	100.00
Correctness of attachment	Poor	8	11.43	0	0.00
	Average	20	28.57	0	0.00
	Good	42	60.00	70	100.00
	Total	70	100.00	70	100.00
Correctness of effective suckling	Poor	23	32.86	1	1.43
	Average	0	0.00	0	0.00
	Good	47	67.14	69	98.57
	Total	70	100.00	70	100.00

[Table/Fig-7]: Score comparison of pre- and postintervention with individual components of grading system for infant's mouth attachment and effective suckling during breastfeeding.
p-value <0.001

for both right and left-side posture analysis, i.e., preintervention mean scores for the right side were 5.84 and postintervention were 3.43 with 41.32% change, while preintervention mean scores for the left-side were 6.06 and postintervention were 3.51 with 41.98% change. There was no statistically significant association between types of delivery and RULA scores with p-value >0.05 [Table/Fig-9]. A statistically significant association was found between RULA for the left-side and type of parity, i.e., the multiparous women had a lower mean score change as compared to the primiparous with a p-value of 0.033 [Table/Fig-10].

DISCUSSION

Optimal positioning and latch during breastfeeding are essential for both maternal and infant health outcomes [21]. The present study findings align with previous literature that underscores the significance of maternal posture about breastfeeding success and the prevention of MSDs. Various positions- such as the cradle, cross-cradle, and football hold are recommended; however, maintaining a neutral, supported position is consistently shown to enhance breastfeeding duration and maternal comfort. In the present study, ergonomic education significantly improved both maternal RULA scores and infant latch quality, corroborating prior evidence that tailored posture training reduces MSD risk in lactating mothers [22,23]. For instance, Sambyal S et al., (2023) demonstrated that ergonomic intervention in breastfeeding mothers decreased rates of neck and lower back pain and increased breastfeeding satisfaction [21].

The present study reflects a high prevalence of caesarean deliveries in India, a trend corroborated by recent national surveys. These

Variables	Intervention	Mean	SD	Mean Diff.	SD Diff.	% Change	z-value	p-value
RULA right	Preintervention	5.84	0.96					
	Postintervention	3.43	1.15	2.41	1.47	41.32	6.7096	0.0001*
RULA left	Preintervention	6.06	1.05					
	Postintervention	3.51	1.02	2.54	1.39	41.98	7.0618	0.0001*

[Table/Fig-8]: Comparison of preintervention and postintervention for Rapid Upper Limb Assessment (RULA) scores at right and left-sides using Wilcoxon matched pair test.
*p<0.05

Variables	FTVD			LSCS			U-value	Z-value	p-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Breastfeed form	5.47	2.23	34.93	5.47	2.37	36.04	592.50	-0.2233	0.8233
RULA-right	2.32	1.49	35.24	2.39	1.42	35.75	603.00	-0.0999	0.9204
RULA-left	2.59	1.42	36.40	2.44	1.36	34.65	581.50	0.3525	0.7244

[Table/Fig-9]: Comparison of types of delivery with change scores of the grading system for infant's mouth attachment and effective suckling during breastfeeding and Rapid Upper Limb Scores Assessment (RULA) at right and left sides using the Mann-Whitney U test.

Variables	Primiparous			Multiparous			U-value	Z-value	p-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Grading for effective latch	5.03	2.2	31.92	5.86	2.32	38.69	492.5	-1.3824	0.1668
RULA-right	2.06	1.5	31.26	2.62	1.36	39.28	470.5	-1.6413	0.1007
RULA-left	2.91	1.33	41	2.16	1.34	30.59	429	2.1295	0.0332*

[Table/Fig-10]: Comparison of parity with change scores of grading system for infant's mouth attachment and effective suckling during breastfeeding and rapid upper limb scores assessment (RULA) at right and left-sides using Mann-Whitney U test.
*p<0.05

surveys indicate C-section rates surpassing the World Health Organisation's recommended range of 10-15%, with particularly elevated rates observed in the Karnataka region [24].

Lactogenesis involves the maturation of alveolar cells and occurs in two stages. Delayed lactogenesis is commonly observed in primiparous women due to a lack of previous breastfeeding experience, and in caesarean section women due to reduced oxytocin pulsatility and prolactin release during early suckling [25,26]. This study confirmed these findings, comparing delivery type with milk expression. Statistically significant differences were observed in the mean breastmilk initiation between women with normal deliveries and caesarean sections. Even with high rates of establishment of milk on day 0 and day 1 in vaginal delivery participants, the initiation of breastfeeding was not seen for every individual. The multiparous vaginal delivery had established breastfeeding by day 1, possibly reason of which can be familiarity with the practice of feeding, early milk expression and positive breastfeeding experience during the previous pregnancy [27]. Another commonly stated reason for delay in breastfeeding in vaginal delivery was difficulty coming to a sitting posture due to episiotomy suture pain. According to the study, left lateral sitting posture scored lowest on VAS (14.5/100) and was the least painful breastfeeding posture out of the available postures such as sitting with legs straight on bed, right lateral, reclining position, sitting with legs down and the highest score rates for cross legged sitting (74.82/100) [28]. The delay in milk expression in caesarean section participants led to delayed initiation of breastfeeding. These findings suggest that the negative impact of caesarean delivery on early breastfeeding may be due to factors such as delayed lactation onset, limited mother-infant contact, and impaired infant suckling. Various reasons contribute to delayed breastfeeding establishment, including the timing of the first feeding, postoperative care procedures, disrupted bonding, and delay in mothers holding their newborns. Fatigue and suture pain experienced by mothers after birth may also hinder early breastfeeding by limiting their ability to engage in basic activities like bed mobility and assuming an upright posture [29].

Ergonomic training significantly improved infant latching, suckling scores, and maternal posture, although some issues like neck twisting, foot support, and wrist strain persisted postintervention. Common pretraining problems included poor back support, twisted posture, and suboptimal infant positioning. Caesarean mothers faced added discomfort affecting posture, while attachment and suckling issues were linked to positioning challenges. Despite pandemic-related constraints and individual delivery types, ergonomic education consistently enhanced breastfeeding quality.

Limitation(s)

The limitations of the study included shorter hospital stays due to the COVID-19 epidemic, thus reducing the intervention duration. Consequently, prevalence rates of hospital deliveries couldn't be used to calculate sample size, leading to a reduced sample size. Additionally, the assessment of participants' compliance with the advised ergonomic posture during breastfeeding sessions was not conducted.

CONCLUSION(S)

The RULA and infant mouth attachment and suckling effectiveness scores were significantly impacted by ergonomic education regarding breastfeeding posture. No significant difference was found in preintervention scores of both the scales, based on delivery type and maternal parity. This emphasises the importance of breastfeeding posture education for all postpartum mothers, regardless of their experience, to establish proper infant latch and prevent future MSDs. This underscores the crucial role of physiotherapists in the early postpartum period, providing knowledge and support for pain-free motherhood and a positive puerperium experience.

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