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A Quasi-Experimental Study to Assess Effectiveness of Kangaroo Mother Care on the Health Parameters of LBW Babies and Maternal Infant Bond and Maternal Stress Among Mothers at NICU, NMCH

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Abstract: *Background:*
Low birth weight (LBW) babies are among the most vulnerable new-borns, facing high risks of hypothermia, sepsis, feeding difficulties, and delayed growth. In low-resource countries like India, where incubator access is limited, Kangaroo Mother Care (KMC) provides a simple, cost-effective alternative. It promotes thermoregulation, breastfeeding, emotional bonding, and maternal confidence while reducing neonatal morbidity and mortality. Recognizing its importance, this study aimed to assess the effectiveness of KMC on the health parameters of LBW babies and its impact on maternal–infant bonding and maternal stress among mothers admitted to the NICU at NMCH, Jamuhar.
Methods:
A quasi-experimental one-group pre-test and post-test design was adopted. Sixty postnatal mothers with LBW babies were selected using purposive sampling. A structured questionnaire and observation checklist were used to assess maternal knowledge and practice. After the pre-test, mothers received a 45-minute structured teaching programme including demonstrations and visual aids. Post-test data were collected three days later. Statistical analysis used descriptive statistics for frequency, mean, and percentage, and inferential statistics (t-test and chi-square) to test the hypotheses and associations.
Results:
Before the intervention, 80% of mothers had average knowledge and 20% had poor knowledge regarding Kangaroo Mother Care (KMC). After the educational programme, 95% of mothers achieved good knowledge, and only 5% remained average. The mean pre-test knowledge score was 21.38 (SD = 3.39), while the post-test mean rose to 29.46 (SD = 2.00), showing a statistically significant improvement ($t = 22.75$, $p < 0.001$). Educational qualification and occupation were significantly associated with post-test scores, whereas age and family type were not. In addition to knowledge improvement, observational findings indicated notable behavioral and clinical changes among both mothers and infants. There was a marked improvement in maternal handling confidence, increased frequency and duration of skin-to-skin contact, enhanced breastfeeding initiation, and better feeding responses in infants. Post-intervention observations also showed visible emotional bonding between mother and baby, with mothers reporting reduced anxiety and greater satisfaction in new-born care. Babies receiving KMC demonstrated stable body temperature, consistent weight gain, deeper sleep patterns, and calmer behavior compared to pre-

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intervention observations.
Conclusion:
The study concluded that KMC is an effective and feasible method to improve neonatal outcomes and strengthen maternal–infant relationships. Structured education substantially increased maternal knowledge, confidence, and adherence to KMC practices. It contributed to better infant thermoregulation, weight gain, and reduced maternal anxiety and stress. KMC should be promoted as a standard practice for all mothers of LBW babies, especially in resource-limited neonatal units. The findings highlight the nurse's pivotal role in initiating, teaching, and supporting mothers to maintain KMC both in hospital and at home.
Implications:
The study underscores the need for regular, comprehensive food safety education reinforced by policy mandates. Institutional kitchens should implement supervision, periodic evaluations, and infrastructural support to maintain compliance. Adapting teaching methods to the language and literacy of workers and using visual, participatory materials enhances reach and efficacy. These interventions have broad potential to reduce foodborne disease risks and improve public health outcomes across diverse institutional settings..

Keywords: Maternal Health, Child Health, New-born Care, Pediatric Nursing, Kangaroo Mother Care, Conventional Cuddling Care, Primigravida Mothers, Maternal and Infant Care, Nursing Education, Structured Teaching Program, Knowledge Assessment, Pre-test and Post-test Design, Effectiveness Evaluation, Paired t-test, Chi-square Test, Hospital Settings, India, Public Health, Nursing Interventions, Health Promotion, Patient Care, Research Methodology, Evidence-Based Practice

I. INTRODUCTION

Postpartum depression (PPD) is one of the most common mental health problems affecting women during the postpartum period, defined from childbirth until one year after delivery[1]. Nearly 85% of women experience some form of mood disturbance following birth, while 10–15% develop clinically significant depression that interferes with maternal functioning[2]. The condition is characterized by a spectrum of depressive symptoms including sadness, anhedonia, hopelessness, low confidence, guilt, self-blame, fatigue, disturbed sleep, anxiety, and suicidal ideation[3]. Although childbirth is generally regarded as a joyful event, many mothers experience emotional instability known as postnatal depression (PND), which may compromise their adjustment to the new maternal role[4]. PPD often remains undetected because of its gradual onset and vague presentation. Symptoms may persist for several months and, in some cases, up to one-year postpartum[5]. Studies in India have documented high rates of maternal depression: prospective research in Goa and rural South India detected depressive disorders in 23% and 16% of postpartum women, with 11–14% continuing to experience symptoms six months after childbirth[6]. Similarly, a study in Karad, Maharashtra found the prevalence of postnatal depression among primigravid mothers to be 13.2%[7]. International investigations have reported rates between 4.4% and 73.7%, with systematic reviews suggesting an average global prevalence of around 13%[8]. Such findings highlight an important public health concern that requires systematic screening and timely intervention[9]. Nurses and midwives are strategically positioned to identify depressive symptoms early, as they spend extensive time interacting with antenatal and postnatal mothers[10]. Proper training in mental health assessment enables them to initiate early support or refer patients for specialized care. Untreated PPD can result in poor maternal self-care, impaired bonding, infant neglect, adverse developmental outcomes, and increased risk of chronic mood disorders in later life[11]. Hence, empowering nurses through structured teaching and continuous professional education can help mitigate these consequences and promote maternal-infant well-being[12]. Kangaroo Mother Care (KMC), introduced in Colombia in 1978, exemplifies a cost-effective, humane intervention that benefits both mother and new-born. It involves skin-to-skin contact, exclusive breastfeeding, early discharge, and follow-up care, particularly for low birthweight infants under 2000 grams[13]. KMC maintains neonatal temperature, prevents hypothermia, enhances

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bonding, and fosters emotional stability in both mother and child[14]. In resource-constrained settings like India, KMC represents an equitable and accessible method of improving neonatal outcomes, emphasizing the essential role of trained nurses in delivering quality and compassionate care[15].

Need for the Study

Skin-to-skin contact, also known as Kangaroo Mother Care (KMC), is a low-cost, evidence-based neonatal practice that has demonstrated significant physiological and developmental benefits[16]. A randomized controlled trial involving 47 healthy mother–infant pairs revealed that initiating skin-to-skin contact within 15–20 minutes post-delivery and continuing for one-hour improved new-born neurobehavioral responses. The infants receiving KMC exhibited longer sleep duration, more quiet sleep states, greater flexor posturing, and fewer extensor movements than control group infants[17]. Each year, an estimated 20.5 million new-borns globally weigh less than 2.5 kg, representing 14.6% of all births, with the majority occurring in low- and middle-income countries[18]. These low-birth-weight infants face higher risks of mortality and morbidity in early life, underscoring KMC as a viable alternative to incubator-based care in resource-limited settings[19]. Despite its advantages, implementation in India remains limited and depends largely on health system commitment, staff education, and maternal acceptance[20]. Evidence from meta-analyses confirms that KMC reduces preterm mortality by approximately 20–40%, shortens hospital stays, decreases infection and sepsis rates, and enhances breastfeeding rates[21]. Physiological studies show that KMC promotes thermoregulation, stabilizes cardiorespiratory parameters, and improves neonatal homeostasis[22]. Equally important are its psychological benefits—mothers practicing KMC report reduced stress, enhanced bonding, and fewer depressive symptoms[23]. Nurses and midwives remain central to KMC's success. Through sustained patient interaction, they identify risk factors, educate mothers, and reinforce adherence to KMC and postpartum mental health care guidelines. Equipping nurses with specialized training through structured programs enables early detection of postpartum depression and more effective emotional support for mothers, ultimately improving both neonatal and maternal outcomes[24]. Thus, KMC stands as a cornerstone of evidence-based neonatal care that bridges technology gaps, promotes maternal mental health, and ensures survival and development for infants born under vulnerable conditions[25].

Statement of the Problem

A study to assess the effectiveness Kangaroo mother care on the health parameters of LBW babies and maternal infant bond and maternal stress among mothers at NICU, NMCH.

Objectives

- To assess the knowledge of mothers regarding KMC and its effect on the health parameters of LBW babies, maternal–infant bond, and maternal stress.
- To evaluate the effectiveness of a structured teaching programme on KMC among mothers of LBW infants.
- To determine the association between knowledge levels and selected demographic variables.
- To create awareness regarding KMC among mothers of infants admitted to the NICU.

Hypotheses

H_0- There will be a no There will be a significant difference between pretest and post test score on knowledge regarding kangaroo mother care on the health parameters of LBW babies and maternal infant bond and maternal stress among mothers of babies admitted in Post natal ward at selected hospital

H_1- There will be a significant difference between pretest and post test score on knowledge regarding kangaroo mother care on the health parameters of LBW babies and maternal infant bond and maternal stress among mothers of babies admitted in Post natal ward at selected hospital

H_2- There will be a significant association between post-test level of knowledge regarding kangaroo mother care on the health parameters of LBW babies and maternal infant bond and maternal stress among mothers of babies with their selected demographic variables.

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II. METHODOLOGY

Research Design

- **Approach:** Quantitative, quasi-experimental, one group pretest-posttest design.
- **Setting:** Neonatal Intensive Care Unit, Narayan Medical College and Hospital, Gonda.
- **Sample:** Postnatal mothers of babies admitted to NICU, selected using purposive sampling.
- **Inclusion Criteria:** Mothers with babies having Apgar score of 6 or above at 1 minute, babies being breastfed, and mothers willing to participate in Kangaroo Mother Care.
- **Exclusion Criteria:** Mothers with babies having Apgar score 5 or less, mothers who previously received health education on Kangaroo Mother Care, mothers unable to understand/read Tamil, and mothers unwilling to participate.

Data Collection:

Data collection was conducted in three phases at the Neonatal Intensive Care Unit (NICU) of Narayan Medical College and Hospital (NMCH), Gonda. Initially, a pretest was administered to 60 postnatal mothers using a structured questionnaire to assess baseline knowledge of Kangaroo Mother Care (KMC). Immediately following this, a structured teaching program including a video-assisted session on KMC was delivered. After three days, a posttest was conducted using the same questionnaire to evaluate knowledge improvement. Purposive sampling was used to select mothers meeting inclusion criteria such as Apgar score ≥6, breastfeeding babies, and willingness to participate.

Intervention

The intervention consisted of a structured teaching program on KMC focusing on skin-to-skin contact, benefits for low-birth-weight babies, enhancing maternal-infant bonding, and stress reduction in mothers. This program was delivered through verbal explanation supported by visual aids and videos, ensuring comprehension and engagement. The intervention aimed to increase maternal knowledge to improve care practices and psychological outcomes.

III. DATA ANALYSIS

Descriptive Statistics: Mean, percentages, standard deviation Inferential Statistics: A paired t-test to analyze effectiveness, chi-square test for associations Confidence level was set at 95% ($p < 0.05$ was considered statistically significant). Data entered into a database using MS Excel / SPSS for analysis, and double entries were performed to help decrease errors. Pre and post-test were analyzed, and results were visually displayed using graphs (bar charts and pie charts) to display changes in knowledge categories. Data were analyzed using descriptive and inferential statistics. Demographic variables were summarized using frequency and percentage distributions. The effectiveness of the intervention was evaluated by comparing pretest and posttest knowledge scores using paired t-tests, with significance set at $p<0.05$. Associations between demographic factors and knowledge levels were examined using Chi-square tests.

IV. RESULTS

Demographic Profile

Majority of mothers (50%) were below 25 years of age, and 33.33% were between 26–30 years.
Most mothers (66.66%) had no formal education.
More than half (58.33%) were housewives.
Half of the participants (50%) belonged to nuclear families.
Regarding mode of delivery, 40% of babies were delivered through normal vaginal delivery, while 25% were delivered by lower segment Cesarean section (LSCS).
As for the source of knowledge, 66.66% received information through mass media, and 25% from relatives and friends.

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Table 4.1 frequency and percentage of demographic variables

S. No.	Category	Subcategory	Frequency (f)	Percent (%)
1	Age of Mothers	Below 25 years	30	50.00
		26–30 years	20	33.33
		30–40 years	10	16.66
		Above 40 years	00	00.00
2	Educational Qualification	No formal education	40	66.66
		Primary	15	25.00
		Secondary	05	08.33
		Degree or above	00	00.00
3	Occupation of Mothers	Housewife	35	58.33
		Business/Company	15	25.00
		Private Employee	10	17.00
		Government Employee	00	00.00
4	Type of Family	Nuclear	30	50.00
		Joint	15	25.00
		Extended Family	15	25.00
		Others	00	00.00
5	Number of Children	1	10	16.66
		2	25	41.66
		3	25	41.66
		4 or above	00	00.00
6	Source of Information	Mass Media (Radio, T.V.)	40	66.66
		Friends and Relatives	15	25.00
		Medical Professionals	05	08.33
		Printed Materials	00	00.00
7	Health Services Availed From	Primary Health Centre (PHC)	35	58.33
		Sub Centre	15	25.00
		Nursing Home	10	16.66
		Hospital	00	00.00
8	Type of Delivery	Normal Delivery	30	50.00
		Lower Segment Caesarean Section (LSCS)	15	25.00
		Forceps Delivery	00	00.00
		Normal Delivery with Episiotomy	15	25.00

Effectiveness of Intervention

Pre-intervention, 80% of mothers had average knowledge and 20% had below-average knowledge of KMC. Post-intervention, 95% of mothers demonstrated good knowledge, showing a statistically significant increase in mean knowledge scores (t-test, $p<0.001$). This indicates that the teaching program effectively enhanced understanding of KMC.

Table 4.2: Level of Knowledge Pre and Post Planned Teaching Program

Level of Knowledge	Pre-test No.	Pre-test (%)	Post-test No.	Post-test (%)	Pearson Chi-square Test
Good	-	-	55	95	$\chi^2 = 68.42$, $p < 0.001$
Average	44	80	5	5	
Below Average	16	20	-	-	

***Significant at p < 0.01**

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The table illustrates the level of knowledge among mess workers before and after the structured teaching program. In the pre-test, none of the participants demonstrated a good level of knowledge, while the majority (80%) had an average level, and 20% had below-average knowledge. This indicates that prior to the intervention, most mess workers had insufficient understanding of the topic, highlighting a need for educational intervention. Following the teaching program, there was a remarkable improvement in knowledge levels. A vast majority (95%) of participants achieved a good level of knowledge, and only 5% remained at an average level, with no participants in the below-average category. This demonstrates that the structured teaching program was highly effective in enhancing knowledge. The Pearson Chi-square test value ($\chi^2 = 68.42$, $p < 0.001$) confirms that the improvement in knowledge post-intervention is statistically significant. This suggests that the educational intervention had a profound impact, effectively bridging knowledge gaps among mess workers. The results also imply that regular structured teaching programs can be an important tool for improving knowledge and practices among institutional food handlers, contributing to better food safety and hygiene standards in the long term.

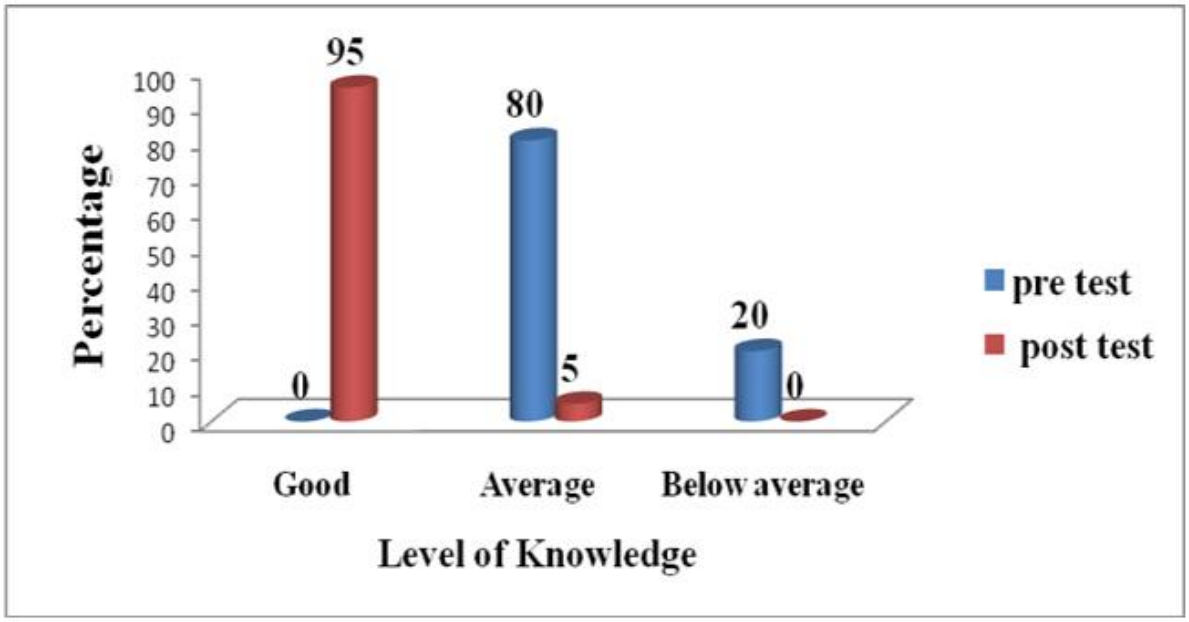

Fig 1.2: Level of Knowledge Pre and Post Planned Teaching Program

V. DISCUSSION

The study confirmed KMC's educational intervention as a powerful tool to improve maternal knowledge, crucial for improving neonatal outcomes and maternal psychological health. The findings align with previous studies indicating increased knowledge translates into better care practices and reduction of maternal stress and postnatal depression. Nurses' role in education and support is critical, given their close contact with postnatal mothers.

Limitations

The study used a single-group pretest–posttest design without a control group, which may limit the strength of causal inferences.

The purposive sampling technique restricted the generalizability of the findings to a wider population.

The short follow-up period measured only immediate knowledge gain and did not assess long-term knowledge retention or behavioral changes.

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VI. CONCLUSION

The teaching program as planned had excellent success at increasing mess workers' knowledge of food handling and storage techniques. There was a significant increase in knowledge scores from pre-test to post-test. The increased number of workers with adequate knowledge from 12% to 55% illustrates the benefit of structured educational interventions. Improvement was seen for all demographic variables (age, gender, education level, work experience and training) illustrating that this intervention can be applied broadly with success. The lack of a relationship between pre-test and post-test scores suggest that an individual's starting knowledge does not define their ability to learn and emphasizes the importance of training for everyone, regardless of experience or background. Mess workers with no formal education were also able to significantly improve their knowledge, which demonstrates that properly devised, visual and participatory teaching methods can surmount barriers posed by reading and literacy. The results highlight that one training session is not enough; ongoing repetitive training, assessment and updates are necessary to ensure ongoing high standards of food safety in institutional kitchens. The study supports the need for regularly mandated inclusive training sessions as part of institutional policy to ensure food safety and compliance with hygiene procedures.

Implications

The implications of the study can be categorized into four key areas related to nursing practice, nursing education, nursing administration, and nursing research:

Implications for Nursing Practice

Nurses in hospital and community settings can play a pivotal role in educating postnatal mothers about Kangaroo Mother Care (KMC) to improve neonatal health and reduce maternal stress and depression.

Routine counseling and support by nurses should be integrated as a standard practice during postnatal care, both in hospital wards and community follow-ups.

Nurses must facilitate continuity of KMC from hospital to home by coordinating with community health workers to ensure ongoing support and follow-up for mothers.

Implications for Nursing Education

KMC and mental health awareness modules should be included in nursing curricula to prepare future nurses for effective mother-infant care and psychosocial support roles.

Nursing students and interns should be involved in practical KMC training and the delivery of health education to postnatal mothers to enhance their competency and confidence.

Simulation-based and audio-visual teaching strategies could be adopted to strengthen nurses' training on KMC and mother-infant bonding interventions.

Implications for Nursing Administration

Nursing administrators should institute regular and mandatory KMC training and refresher courses for nursing staff across maternal and neonatal care units.

Development of monitoring tools and checklists to ensure adherence to KMC protocols and maternal mental health screening guidelines is essential.

Policies encouraging "zero separation" of mother and infant in NICUs and dedicated spaces for KMC should be implemented to facilitate ongoing skin-to-skin contact.

Implications for Nursing Research

Further research is needed to assess long-term retention of knowledge and behavioral change following KMC educational interventions.

Comparative studies involving different training methods and their impact on mother and infant outcomes would inform optimization of KMC programs.

Action research involving nursing students and healthcare teams could help develop cost-effective educational materials and community outreach models to promote KMC.

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Recommendations

For Institutional Implementation

Implement structured KMC orientation programs for all postnatal mothers as part of routine care.

Assign dedicated nursing staff or KMC champions to support mothers throughout their hospital stay and ensure proper technique and continuation at home.

Design and enforce standard operating procedures (SOPs) for KMC practice, supported by facility infrastructure such as comfortable chairs and privacy for mothers.

For Policy Makers and Health Authorities

Integrate KMC promotion into national maternal and child health policies and state health mission initiatives.

Support capacity building through state-level certification and continuous education programs for nurses and community health workers.

Allocate resources for proper infrastructure in neonatal units to facilitate extended skin-to-skin care.

For Community and Home-Based Care

Strengthen community health worker networks to provide home visits, monitor the continuation of KMC, and address challenges postpartum.

Develop culturally appropriate IEC (Information, Education, Communication) materials in regional languages to enhance community awareness and mother compliance.

Encourage family involvement and peer-support groups to provide social and emotional support for mothers practicing KMC.

For Further Research

Conduct longitudinal studies to evaluate the sustained impact of KMC education on infant health and maternal psychological outcomes.

Assess the effectiveness of different modalities of KMC training—face-to-face, digital, blended—and their feasibility in diverse settings.

Explore the barriers and facilitators to KMC implementation from the perspectives of mothers, nurses, and hospital administration to inform tailored interventions.

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