

Original Research Article

Effect of a structured educational intervention on maternal knowledge and self-reported home-based care practices among mothers of preterm newborns: a pre-experimental study

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ABSTRACT

Background: The period surrounding discharge is a critical transition for mothers of preterm newborns, as responsibility for several aspects of infant care gradually shifts from healthcare professionals to the family. Mothers must manage feeding, thermal protection, Kangaroo Mother Care (KMC), hygiene, infection prevention, follow-up, and recognition of neonatal danger signs at home. Adequate preparation is essential for the safe continuation of care after discharge.

Methods: A quantitative, pre-experimental one-group pre-test-post-test study was conducted among 90 postnatal mothers of preterm newborns in a tertiary-care teaching hospital in Greater Noida, Uttar Pradesh, India. Baseline knowledge and self-reported caregiving practices were assessed before the intervention and again seven days later. Each participant received an individualized 45-minute educational session incorporating a PowerPoint presentation, interactive discussion, practical demonstrations, and a take-home brochure. Data were analyzed using descriptive statistics, paired-samples t-tests, Pearson's correlation coefficient, and chi-square tests.

Results: The proportion of mothers with adequate knowledge increased from 2.2% before the intervention to 45.6% at seven-day follow-up. The proportion reporting good caregiving practice increased from 2.2% to 57.8%. Mean knowledge scores increased from 4.96 ± 1.66 to 10.24 ± 1.60 , giving a mean difference of 5.28 points ($t=33.768$, $df=89$, $p<0.001$). Mean practice scores increased from 5.16 ± 1.69 to 10.52 ± 1.38 , with a mean difference of 5.36 points ($t=34.229$, $df=89$, $p<0.001$). Baseline knowledge demonstrated a positive correlation with baseline self-reported practice ($r=0.376$, $p<0.01$).

Conclusions: Maternal knowledge and self-reported home-based caregiving practices showed substantial improvement seven days after participation in the structured educational programme. Structured and individualized discharge education may serve as an effective strategy for strengthening maternal preparation for caring for preterm newborns at home.

Keywords: Preterm newborn, Maternal knowledge, Home-based caregiving practice, Educational intervention, Discharge preparation, Kangaroo mother care

INTRODUCTION

Preterm birth refers to birth occurring before the completion of 37 weeks of gestation and continues to be a

major contributor to neonatal morbidity and mortality worldwide. Physiological immaturity places preterm and low-birth-weight newborns at increased risk of feeding difficulties, thermal instability, infection, and suboptimal

growth.^{1,2} Consequently, care during the neonatal period requires continuous integration between health facilities, families, and community-based services. The World Health Organization (WHO) emphasizes family participation, caregiver education, discharge preparation, and appropriate follow-up as pivotal components of care for preterm and low-birth-weight infants.¹

Discharge from the hospital represents a major shift in the caregiving environment. Once the mother returns home, many routine aspects of newborn care previously supported by healthcare professionals must be managed independently by the family. These include breastfeeding or expressed breast milk feeding, thermal protection, Kangaroo Mother Care (KMC), hygiene, cord care, infection prevention, immunization, scheduled follow-up, and identification of signs requiring emergency medical attention. WHO recommendations strongly emphasize KMC and active involvement of families in the care of preterm and low-birth-weight newborns.^{1,3} Evidence from systematic reviews has further demonstrated the critical role of KMC in reducing mortality and morbidity among low-birth-weight infants.⁴

A mother's readiness for these responsibilities can vary considerably. Previous studies report notable gaps in maternal knowledge regarding KMC and the care of premature newborns, with factors such as educational background, parity, and prior exposure to health information influencing overall preparedness.^{5,6} These findings highlight that discharge planning must extend beyond providing routine verbal instructions and should address individual baseline knowledge gaps.

Educational interventions delivered by nursing staff offer a practical, direct means of strengthening caregiver preparedness. Prior evaluations of video-assisted teaching and structured health education have demonstrated marked improvements in maternal knowledge and caregiving practices related to preterm infant care.^{7,8}

Recent neonatal nursing research underscores the utility of nurse-led empowerment and supportive educational interventions in easing the transition from neonatal intensive care to home.⁹⁻¹² Although general advice is routinely offered in postnatal wards, there remains a need for structured, multimodal approaches that combine essential theoretical information with practical demonstrations and written reinforcement.

This study examined changes in maternal knowledge and self-reported home-based caregiving practices following a structured, individualized educational intervention among mothers of preterm newborns in a tertiary-care teaching hospital in Greater Noida, Uttar Pradesh, India. Additionally, the study evaluated the relationship between baseline knowledge and practice and explored sociodemographic and clinical factors associated with baseline performance.

METHODS

Study design and setting

A quantitative pre-experimental design using a single-group pre-test–post-test approach was adopted. The study was conducted in the postnatal and neonatal care units of a tertiary-care teaching hospital located in Greater Noida, Uttar Pradesh, India, between 2 March and 11 April 2026.

Participants and sampling

Postnatal mothers whose newborns were born preterm (<37 completed weeks of gestation) and receiving care at the study facility during the data-collection period were considered for inclusion. Using non-probability purposive sampling, 90 mothers were enrolled. Mothers were included if they delivered before 37 completed weeks of gestation, provided written informed consent, and were available for both initial and follow-up assessments. Exclusion criteria were critical maternal illness, mothers of infants with life-threatening congenital anomalies, and inability to communicate in Hindi or English. All 90 enrolled mothers completed both assessments, resulting in zero loss to follow-up.

Sample size estimation

The sample size was calculated prior to data collection using a standardized mean-difference approach. Assumptions included a two-sided significance level (alpha) of 0.05, 80% statistical power (1-beta), an anticipated standard deviation (sigma) of 8 score units, and a minimum clinically meaningful mean difference (Delta) of 4 score units.

The standard formula applied was:

$$n = [(Z_{\alpha/2} + Z_{\beta})^2 \times 2\sigma^2] / \Delta^2$$

where $Z_{\alpha/2} = 1.96$, $Z_{\beta} = 0.84$, $\sigma = 8$, and $\Delta = 4$.

The resulting estimate was 62.72 participants and was rounded to 63. Allowance for 20% anticipated attrition produced an adjusted requirement of approximately 79 participants:

$$n(\text{adjusted}) = 63 / (1 - 0.20) = 78.75.$$

A total of 90 mothers were recruited to ensure adequate statistical power and accommodate potential non-response.

Data collection instruments

Data were gathered using two investigator-developed structured tools; maternal knowledge questionnaire: A 15-item multiple-choice instrument covering KMC, breastfeeding/expressed breast milk feeding,

thermoregulation, infection control, umbilical cord care, and recognition of neonatal danger signs. Each correct item scored 1 point (total range: 0-15). Knowledge scores were categorized as inadequate (0-5), moderate (6-10), or adequate (11-15). The internal consistency was acceptable (Cronbach's $\alpha=0.718$).

Self-Reported Caregiving Practice Checklist: A 15-item structured checklist assessing reported routine practices across feeding, thermal maintenance, hygiene, infection prevention, danger sign identification, and post-discharge follow-up. Total scores ranged from 0 to 15, categorized as poor (0-5), average (6-10), or good (11-15). Reliability testing yielded an intraclass correlation coefficient (ICC) of 0.890 (95% CI: 0.610-0.974) for single measures and 0.942 (95% CI: 0.758-0.987) for average measures based on a two-way random-effects model. Practice was assessed via structured face-to-face interviews; direct observation of behavior was not performed.

Content validity

Content validity was established by a panel of 13 experts (10 internal experts from the Sharda School of Nursing Science and Research, Sharda University, and 3 external experts from Indian nursing institutions). Panel domains included Pediatric Nursing, Neonatal Nursing, Community Health Nursing, Nursing Education, Nursing Administration, Medical-Surgical Nursing, Mental Health Nursing, and Obstetrics and Gynecology Nursing. Expert feedback guided adjustments in medical terminology simplification and item sequencing.

Educational intervention

Following baseline pre-test administration, each participant received a 45-minute individualized, structured educational session. The intervention integrated; a structured PowerPoint presentation, interactive discussion, hands-on practical demonstrations (focusing on KMC positioning and breastfeeding latching), a take-home educational brochure. The educational framework covered feeding management, thermoregulation, KMC execution, hygiene and cord care, infection control measures, routine immunizations, follow-up schedules, and emergency danger signs. Post-intervention assessment (post-test) was completed seven days later using the same instruments.

Ethical considerations

Ethical clearance was granted by the Institutional Ethics Committee, School of Medical Sciences and Research, Sharda University (Ref No.: SU/SMS&R/76-A/2025/297; date of approval: 4 December 2025). Administrative permission was secured from hospital authorities. Informed written consent was obtained from all participants prior to enrollment, emphasizing voluntary participation and confidentiality.

Statistical analysis

Data were compiled in Microsoft Excel and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean (m) standard deviation (SD), and categorical variables as frequencies and percentages. Pre- and post-intervention scores were compared using paired-samples t-tests. The linear relationship between baseline knowledge and practice was analyzed using Pearson's correlation coefficient (r). Associations between sociodemographic/clinical parameters and baseline scores were evaluated using Chi-square (χ^2) tests. A two-tailed $p<0.05$ was considered statistically significant.

RESULTS

All 90 enrolled postnatal mothers completed the pre-test, intervention, and post-test assessments. Over half of the participants (56.7%) were aged 20-25 years. Secondary education was the most reported educational attainment (45.6%), 58.9% were homemakers, 70.0% belonged to the lower-middle socioeconomic stratum, and 53.3% resided in rural areas. Primiparous mothers represented 58.9% of the cohort, and 61.1% lived in nuclear families. Most mothers (86.7%) had no prior experience caring for a preterm infant, and 64.4% had not received prior formal information on preterm care. Regarding infant gestational age, 57.8% were born at 33-36 weeks, 34.4% at 28-32 weeks, and 7.8% at <28 weeks.

Knowledge and practice category transitions

At baseline, 70.0% of mothers demonstrated inadequate knowledge, which dropped to 1.1% at post-test. Conversely, adequate knowledge increased from 2.2% at pre-test to 45.6% at post-test. Similarly, poor caregiving practice dropped from 64.4% to 0.0%, while good caregiving practice rose from 2.2% to 57.8% (Table 1).

Intervention impact on mean scores

The mean knowledge score increased significantly from 4.96 ± 1.66 to 10.24 ± 1.60 , reflecting a mean gain of 5.28 points ($t=33.768$, $df=89$, $p<0.001$). The mean self-reported practice score increased from 5.16 ± 1.69 to 10.52 ± 1.38 , showing a mean gain of 5.36 points ($t=34.229$, $df=89$, $p<0.001$) (Table 2). Baseline knowledge correlated moderately and positively with baseline practice ($r=0.376$, $p<0.01$).

Baseline associations with sociodemographic variables

Baseline knowledge showed statistically significant associations with maternal age, educational level, socioeconomic status, prior information on preterm care, area of residence, and previous experience with a preterm infant. Baseline practice was significantly associated with maternal age, education, occupation, socioeconomic status, religion, parity, prior information, residence, and prior experience (Table 3).

Table 1: Distribution of maternal knowledge and self-reported caregiving practice before and after the intervention (n=90).

Levels	Knowledge pre-test, N (%)	Knowledge post-test, N (%)	Practice pre-test, N (%)	Practice post-test, N (%)
Inadequate / Poor (0-5)	63 (70.0)	1 (1.1)	58 (64.4)	0 (0.0)
Moderate / Average (6-10)	25 (27.8)	48 (53.3)	30 (33.3)	38 (42.2)
Adequate / Good (11-15)	2 (2.2)	41 (45.6)	2 (2.2)	52 (57.8)

Note: Knowledge and practice were scored from 0 to 15.

Table 2: Comparison of pre-test and post-test knowledge and self-reported practice scores (n=90).

Variables	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean difference	t	df	P value
Knowledge score	4.96 $\pm$ 1.66	10.24 $\pm$ 1.60	5.28	33.768	89	<0.001
Practice score	5.16 $\pm$ 1.69	10.52 $\pm$ 1.38	5.36	34.229	89	<0.001

Note: Baseline knowledge vs. practice correlation: $r=0.376$, $p<0.01$.

Table 3: Associations between baseline maternal characteristics, knowledge and self-reported practice (n=90).

Variables	χ^2 Knowledge	df	P	χ^2 Practice	df	P
Age (years)	13.250	6	0.039	15.584	6	0.016
Educational status	13.250	6	0.039	24.109	6	<0.001
Occupation	12.360	6	0.054	13.369	6	0.038
Socioeconomic status	20.850	6	0.002	19.926	6	0.003
Religion	10.280	6	0.113	15.804	6	0.015
Parity	5.060	4	0.281	13.227	4	0.010
Type of family	4.890	4	0.298	4.962	4	0.291
Prior information on preterm care	6.760	2	0.034	6.698	2	0.035
Area of residence	10.870	4	0.028	11.874	4	0.018
Previous experience with preterm newborn	6.370	2	0.041	7.003	2	0.030
Mode of delivery	6.100	4	0.191	6.686	4	0.153
Gestational age of newborn	4.860	4	0.301	5.508	4	0.239

DISCUSSION

This study evaluated the effect of a multimodal structured educational program on maternal knowledge and home caregiving practices. Following the intervention, substantial improvements were observed in both domains.

The percentage of mothers achieving adequate knowledge expanded from 2.2% to 45.6%, while those reporting good caregiving practices expanded from 2.2% to 57.8%. These trends align with prior evaluations demonstrating the efficacy of structured visual and practical instruction on neonatal outcomes.^{7,8}

The intervention's success likely stems from its multimodal delivery framework. Combining oral

exposition, visual aids (PowerPoint), practical demonstrations (KMC positioning, latching), and printed material (brochures) accommodates varied literacy levels and learning styles. Nursing literature stresses that structured empowerment programs reduce parental distress and improve care self-efficacy during the critical transition from hospital to home.⁹⁻¹²

Although baseline knowledge correlated positively with baseline practice ($r=0.376$), the moderate strength of this association indicates that knowledge alone does not fully dictate behavior. Practical confidence, familial support, physical environment, and economic constraints also dictate care implementation at home, a finding echoed in broader KMC literature.^{5,6}

The associations identified between baseline scores and sociodemographic variables (e.g., education, parity, prior exposure) underscore the necessity of individualizing discharge planning. Identifying vulnerable or inexperienced caregivers early allows nursing personnel to target instruction effectively.

Limitations

This study has several limitations. First, the pre-experimental single-group design lacks a control arm, precluding definitive causal inferences; observed improvements could be influenced by extraneous information sources or repeated testing effects.

Second, caregiving practices were measured via self-report rather than direct observational checklists, introducing potential social desirability or recall bias.

Third, the seven-day follow-up period evaluates short-term retention rather than long-term behavioral compliance or clinical infant outcomes (such as readmission rates or weight gain). Finally, sampling was confined to a single tertiary institution, limiting broader generalizability.

CONCLUSION

Participation in a single-session, 45-minute structured educational intervention was followed by significant short-term gains in maternal knowledge and self-reported home caregiving practices among mothers of preterm infants.

Incorporating multimodal teaching methodologies—combining demonstration with visual and written reinforcement—serves as a valuable, practical strategy for routine discharge preparation in neonatal units. Randomized controlled trials with longer follow-up durations and direct observational measures are recommended to establish long-term clinical efficacy.

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