



Knowledge and Attitude Regarding Storage of Expressed Breast Milk Among Postnatal Working Mothers Attending a Community Health Centre: A Descriptive Cross-Sectional Study from Lucknow, Uttar Pradesh, India

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ABSTRACT

Background: Expressed breast milk (EBM) storage is an evidence-based strategy that enables postnatal working mothers to sustain exclusive breastfeeding after returning to work. Inadequate knowledge and unfavourable attitudes toward EBM storage remain critical barriers to breastfeeding continuation, particularly among lower-income and semi-urban working populations in India. **Objective:** To assess the level of knowledge and attitude regarding the storage of expressed breast milk among postnatal working mothers, and to examine associations between knowledge, attitude, and selected demographic variables. **Methods:** A quantitative descriptive cross-sectional study was conducted at Community Health Centre (CHC) Gudamba, Lucknow, Uttar Pradesh, India. One hundred postnatal working mothers were recruited through non-probability purposive sampling. A researcher-developed, expert-validated structured 25-item multiple-choice questionnaire and a 10-item four-point Likert attitude scale were used as data collection instruments. Tool reliability was confirmed by test-retest ($r = 0.82$, knowledge) and split-half methods ($r = 0.97$, attitude). Data were analysed using descriptive statistics and chi-square tests of independence at a significance level of $\alpha = 0.05$. **Results:** The majority of participants (45%) were aged 22–24 years. Regarding knowledge, 77% demonstrated average knowledge (score 9–17), 7% good knowledge (score 18–25), and 16% poor knowledge (score 0–8); mean knowledge score was 12.04 ± 3.21 . Regarding attitude, 98% demonstrated positive attitudes and 2% negative attitudes (theoretical scale range: 10–40); mean attitude score was 25.51 ± 2.15 . Chi-square analysis revealed no statistically significant association between knowledge and any selected demographic variable, nor between attitude and any selected demographic variable ($p > 0.05$). The Pearson correlation analysis revealed a negligible positive correlation between knowledge and attitude scores among participants ($r = 0.019$, $p = 0.851$) indicating that the relationship was not statistically significant. **Conclusion:** Postnatal working mothers demonstrated predominantly average knowledge despite largely positive attitudes toward EBM storage. The knowledge deficit observed across all demographic subgroups underscores the need for structured, nurse-led health education programmes at community health centres to translate positive attitudes into adequate knowledge and safe EBM storage practices.

Keywords: expressed breast milk; breast milk storage; postnatal working mothers; breastfeeding; knowledge; attitude

INTRODUCTION

Breastfeeding is universally recognised as the gold standard of infant nutrition, offering unparalleled immunological, nutritional, and developmental benefits. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend exclusive breastfeeding for the first six months of life, followed by continued breastfeeding alongside appropriate complementary feeding for up to two years and beyond [1]. Colostrum the first secretion of the lactating breast serves as the infant's initial immunisation, providing passive immunity and the first line of defence against neonatal infection [2]. Scientific evidence demonstrates that breastfeeding prevents approximately six million infant deaths annually by reducing the incidence of diarrhoeal disease and acute respiratory infections [3].

India continues to face a substantial burden of neonatal and child mortality, although significant improvements have been achieved over recent decades. Optimal breastfeeding practices are recognized as important child-survival interventions, with

global evidence suggesting that effective implementation of proven interventions, including breastfeeding, could prevent a considerable proportion of under-five deaths [4]. Early initiation of breastfeeding and exclusive breastfeeding during the first six months are essential components of optimal infant and young child feeding practices. However, exclusive breastfeeding remains an area requiring continued attention in India. According to the National Family Health Survey-5 (2019–21), only 63.7% of infants below six months were exclusively breastfed, indicating that a considerable proportion did not receive exclusive breastfeeding [5]. These practices are influenced by multiple individual, family, cultural, and health-system factors, highlighting the need for appropriate maternal education and breastfeeding support. Despite this evidence, exclusive breastfeeding rates in India remain suboptimal, with multi-factorial barriers operating at the individual, household, and structural levels.

Maternal employment is a recognised barrier to the continuation of exclusive breastfeeding, particularly when workplace

conditions do not adequately support breastfeeding practices. In India, women's participation in the workforce has increased, with the female worker population ratio reaching 26.0% in urban areas during 2023–2024 [6]. Although the Maternity Benefit (Amendment) Act, 2017 provides up to 26 weeks of paid maternity leave for eligible women, disparities in employment arrangements and workplace breastfeeding support may influence the continuation of breastfeeding following maternal return to work [7] and substitution with formula feeding, which carries substantially higher risks of infant morbidity and mortality.

Expressed breast milk (EBM) storage represents an evidence-based strategy that enables working mothers to provide human milk to their infants during work hours. Correct knowledge of EBM expression techniques, safe storage temperatures and durations, and appropriate handling practices is essential for the safe utilisation of EBM. Existing evidence consistently documents a substantial knowledge deficit in this domain. A cross-sectional study among 100 working breastfeeding postnatal mothers at a tertiary care centre in Hyderabad, India, found that 64% had unsatisfactory knowledge regarding EBM feeding [8]. A study among 180 working mothers at a teaching hospital in Kathmandu, Nepal, reported that only 50% had adequate knowledge and 52.2% held a negative attitude toward expressed breastfeeding [9]. A descriptive cross-sectional study among 255 mothers reported that 54.1% demonstrated low awareness regarding EBM [10]. A cross-sectional study among female garment factory workers in Dhaka, Bangladesh, found that the large majority had poor knowledge regarding breastfeeding benefits [11].

Despite the public health significance of EBM storage knowledge, evidence from primary and community healthcare settings in Uttar Pradesh — a state with persistently elevated infant mortality and low exclusive breastfeeding rates — is scarce. Most existing studies have been conducted in tertiary hospitals or urban centres, limiting their transferability to semi-urban and rural community health centre (CHC) populations. This study was therefore conducted to fill this contextual gap by assessing knowledge and attitude regarding EBM storage among postnatal working mothers attending a CHC in Lucknow, and to examine demographic associations with these outcomes. A self-instructional module (SIM) on EBM storage was additionally developed as a practice-oriented study output.

Research Objectives

1. To assess the level of knowledge regarding the storage of expressed breast milk among postnatal working mothers.
2. To assess the level of attitude regarding the storage of expressed breast milk among postnatal working mothers.
3. To examine the association between knowledge regarding EBM storage and selected demographic variables.
4. To examine the association between attitude regarding EBM storage and selected demographic variables.
5. To find out the correlation between the knowledge and attitude regarding the storage of expressed breast milk among postnatal working mothers.

MATERIALS AND METHODS

Study Design and Setting

A quantitative descriptive cross-sectional study was conducted at Community Health Centre (CHC) Gudamba, Lucknow, Uttar Pradesh, India. This report adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [12].

Study Population

The target population comprised postnatal working mothers visiting CHC Gudamba, Lucknow. The accessible population consisted of eligible postnatal working mothers attending the CHC during the data collection period.

Eligibility Criteria

Inclusion criteria:

- Postnatal working mothers visiting CHC Gudamba, Lucknow
- Postnatal working mothers within six weeks of delivery
- Willing to provide informed consent and participate

Exclusion criteria:

- Postnatal mothers who were not currently employed
- Mothers unwilling to participate
- Mothers who had previously attended a formal educational programme regarding EBM storage

Sample Size and Sampling Technique

A sample of 100 postnatal working mothers was recruited. Participants were recruited through non-probability purposive sampling, enrolling all eligible mothers attending the CHC during the data collection period who satisfied the inclusion criteria.

Research Instruments

The data collection tool comprised three sections:

Section I – Demographic Profile: Collected data on ten variables: age, educational status, type of family, area of residence, occupational status, monthly family income, daily working hours, method of infant feeding in the mother's absence, availability of a workplace break for EBM expression, and source of information regarding EBM storage.

Section II – Structured Knowledge Questionnaire: A researcher-developed structured multiple-choice questionnaire comprising 25 items, each with four response options (one correct). Each correct response was awarded one mark; incorrect responses were awarded zero marks. Total achievable score: 0–25. Knowledge was categorised as: Good: 18–25, Average: 9–17, Poor: 0–8.

Section III – Attitude Scale: A 10-item four-point Likert scale assessed attitude toward EBM storage. Items included both positive and negative statements. Positive statements were scored from 1 (Disagree) to 4 (Strongly Agree). Negative statements were reverse-scored (4 for Disagree to 1 for Strongly Agree). Total achievable score: 10–40 (theoretical minimum = $10 \times 1 = 10$; theoretical maximum = $10 \times 4 = 40$). Attitude was categorised as: Positive: 21–40, Negative: 10–20

Validity and Reliability

Content validity of the instruments was established through expert panel review comprising three nursing experts and one medical expert. Suggested modifications were incorporated, and the final instrument was translated into Hindi for participant accessibility. Tool reliability was assessed using the test–retest method for the knowledge questionnaire ($r = 0.82$) and the split-half method for the attitude scale ($r = 0.97$), both indicating high reliability.

Data Collection Procedure

Data were collected following written administrative permission from the concerned authorities of CHC Gudamba, Lucknow. One hundred participants meeting the inclusion criteria were enrolled over a four-week data collection period. Written informed consent was obtained from each participant prior to enrolment. Data were collected using the interview technique the researcher administered the questionnaire and attitude scale to each participant individually. Following data collection, the self-instructional module was provided to all participants on the same day.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethical Committee, St. Mary’s College of Nursing, Kursi Road, Lucknow, Uttar Pradesh, India. Written administrative permission was obtained from the concerned authorities of CHC Gudamba, Lucknow. Informed consent was obtained from all study participants. Confidentiality and anonymity of all data were maintained throughout. Participation was entirely voluntary, and participants were assured of their right to withdraw at any stage.

Statistical Analysis

Data were coded and entered into a master sheet. Statistical analysis was performed using SPSS. Descriptive statistics including frequency, percentage, mean, standard deviation (SD), median, and range were calculated for demographic variables, knowledge scores, and attitude scores. The chi-square (χ^2) test

of independence was used to examine associations between knowledge levels and selected demographic variables and between attitude levels and selected demographic variables. A significance level of $\alpha = 0.05$ was applied throughout. The correlation between knowledge and attitude levels was assessed using the Pearson correlation test.

RESULTS

Demographic Characteristics

The majority (45%) were aged 22–24 years (range: 22–30 years). Most participants (59%) belonged to nuclear family structures and resided in rural areas (68%). Educational attainment was predominantly up to 10th grade (72%), with the remaining 28% holding diploma-level qualifications; no participant held a graduate or postgraduate degree. With respect to occupational status, 50% were self-employed, 19% were government employees, 18% were daily wage labourers, and 13% belonged to other occupational categories. The most common monthly income bracket was INR 10,001–30,000 (67%). Regarding working hours, 45% worked 6–8 hours per day and 44% worked 8–10 hours per day. The majority (62%) used feeding bottles to feed their infant in their absence; 38% used a spoon and cup. More than half of participants (53%) reported having a workplace break of 15–30 minutes available for EBM expression, while 47% reported having no such facility. Relatives constituted the primary source of information regarding EBM storage for 57% of participants, followed by friends (23%) and health personnel (20%).

Level of Knowledge Regarding EBM Storage

Table 1 presents the frequency distribution of knowledge levels. The majority of participants (77%) demonstrated average knowledge (score 9–17), while 7% demonstrated good knowledge (score 18–25) and 16% demonstrated poor knowledge (score 0–8). The mean knowledge score was 12.04 (SD = 3.21).

Table 1. Frequency and Percentage Distribution of Knowledge Levels Regarding EBM Storage (N = 100)

Level of Knowledge	Score Range	Frequency (n)	Percentage (%)	Mean ± SD
Good	18–25	7	7.0	12.04 ± 3.21
Average	9–17	77	77.0	
Poor	0–8	16	16.0	

Total = 100 (100%). EBM = expressed breast milk

Table 2. Frequency and Percentage Distribution of Attitude Levels Regarding EBM Storage (N = 100)

Level of Attitude	Score Range	Frequency (n)	Percentage (%)	Mean ± SD
Positive	21–40	98	98.0	25.51 ± 2.15
Negative	10–20	2	2.0	

Level of Attitude Regarding EBM Storage

Table 2 presents the frequency distribution of attitude levels. The large majority (98%) demonstrated a positive attitude toward EBM storage (score 21–40), while only 2% demonstrated a negative attitude (score 10–20). The mean attitude score was 25.51 (SD = 2.15).

Association Between Knowledge and Demographic Variables

Chi-square analysis revealed no statistically significant association between the level of knowledge and any of the selected demographic variables including age, type of family, area of residence, educational status, occupational status, monthly income, working hours, method of infant feeding, availability of a workplace EBM break, and source of information at $\alpha = 0.05$

Association Between Attitude and Demographic Variables

Chi-square analysis similarly revealed no statistically significant association between the level of attitude and any selected demographic variables including age, type of family, area of residence, educational status, occupational status, monthly income, working hours, method of infant feeding, availability of a workplace EBM break, and source of information at $\alpha = 0.05$.

Correlation Between Knowledge and Attitude

The Pearson correlation analysis revealed a negligible positive correlation between knowledge and attitude scores among participants ($r = 0.019$, $p = 0.851$). The relationship was not statistically significant at the 0.05 level. This finding indicates that there was no statistically significant linear association between knowledge and attitude scores.

Table 3. Correlation Between Knowledge and Attitude Scores Among Participants

Variables	Mean	SD	r-value	p-value
Knowledge score	12.04	3.21	0.019	0.851
Attitude score	25.51	2.15		

DISCUSSION

Knowledge Regarding EBM Storage

The finding that only 7% of postnatal working mothers achieved good knowledge and that 77% remained at the average level with a mean and standard deviation 12.04 ± 3.21 highlights a substantial knowledge deficit regarding EBM storage in this CHC-based population. These findings are consistent with a growing body of Indian and international evidence documenting inadequate knowledge in this domain. A cross-sectional study among 100 working breastfeeding postnatal mothers at a tertiary care centre in Hyderabad, India, reported unsatisfactory knowledge in 64% of participants, with only 36% demonstrating satisfactory knowledge regarding EBM feeding [8]. A questionnaire-based cross-sectional study among 95 mothers attending a tertiary care hospital in Miraj found that correct knowledge regarding EBM storage was present in only 35.7% of participants, and the prevalence of EBM expression in clinical practice was as low as 17.9% [14]. A study conducted by Kalita [13] among 60 working mothers in Bengaluru, India, reported that 83.3% had inadequate knowledge regarding the domiciliary management and storage of expressed breast milk (EBM) before the implementation of a planned teaching programme. Following the intervention, 98.3% demonstrated adequate knowledge, indicating a substantial improvement in knowledge regarding EBM collection and storage practices [13].

Comparable findings have been reported in international studies. A cross-sectional study among 180 working mothers at Kathmandu Medical College Teaching Hospital, Nepal, found that only 50% had adequate knowledge regarding expressed breastfeeding, and only 11.7% had ever expressed breast milk, citing inadequate breast milk production (30.7%) and lack of time (26.4%) as the chief barriers [9]. A cross-sectional study among 395 working women in public well baby clinics in Kenya

revealed that knowledge gaps in EBM expression and storage were widespread, and that tertiary education (OR = 4.47; 95% CI: 2.01–11.07) was independently associated with satisfactory EBM knowledge [20]. Among 385 employed mothers in another cross-sectional study, overall knowledge of EBM was reported at only 36% [16].

Collectively, the mean knowledge percentage of 48.2% in the present study indicates that, on average, participants answered fewer than half of the knowledge questions correctly, reflecting insufficient preparation for safe EBM storage. The finding that 57% of participants derived EBM-related information primarily from relatives and only 20% from health personnel provides a plausible explanatory mechanism: informal social networks are less likely to convey clinically accurate information about correct EBM storage temperatures, containers, and durations. Studies confirm that health professional counselling is significantly associated with superior breastfeeding knowledge and practice [11, 19].

Attitude Regarding EBM Storage

The finding that 98% of postnatal working mothers held positive attitudes toward EBM storage with a mean attitude score of 25.51 ± 2.15 out of 40 is substantially higher than rates reported in comparable studies. A study among 180 working mothers in Kathmandu found that 52.2% held a negative attitude toward expressed breastfeeding [9]. A descriptive survey among postnatal women reported unfavourable attitudes in 68.75% of participants, with only 31.25% holding favourable attitudes [15]. A cross-sectional study among working postnatal mothers in Hyderabad found positive attitudes in 60%, with 40% holding negative attitudes [8]. In a cross-sectional study in Jakarta among factory and office workers, attitude toward breastfeeding significantly varied by occupational category [19].

The markedly high proportion of positive attitudes in the present sample warrants careful interpretation. Several potential explanations merit consideration. First, participants were actively employed working mothers who had self-selected to visit a CHC, suggesting a population already motivated toward maternal and child health-seeking behaviour. Second, the social desirability of expressing positive attitudes toward infant feeding in a healthcare context may have introduced response bias, particularly given the use of the interview technique for data collection. Third, the CHC context in semi-urban Lucknow may reflect particular socio-cultural norms around infant feeding that are more receptive to EBM as a concept.

Critically, however, the comparative analysis of near-universal positive attitude (98%) with a mean knowledge percentage of only 48.2% reveals a significant knowledge attitude gap: participants expressed positive orientations toward EBM storage without possessing the knowledge necessary to safely implement it. This finding is consistent with the attitude behaviour gap in health education theory, which recognises that positive attitudes are necessary but insufficient for safe health practices in the absence of corresponding knowledge [21].

Associations with Demographic Variables

The absence of statistically significant associations between knowledge and all selected demographic variables including age, education, family type, residence, occupational category, income, working hours, feeding method, break availability, and information source indicates that inadequate knowledge regarding EBM storage was uniformly distributed across demographic subgroups in this CHC population. This finding diverges from studies that have documented education- and employment-related differentials in EBM knowledge. A cross-sectional study in Jakarta among 192 factory and office workers reported that white-collar workers were significantly more likely to have good breastfeeding knowledge than blue-collar workers (73% vs. 55%; $p < 0.001$) [19]. A Kenyan study among 395 working women found that tertiary education and public sector employment were independently associated with higher odds of satisfactory EBM knowledge [20].

The non-replication of these demographic gradients in the present study may reflect the marked homogeneity of the sample. The educational distribution was heavily concentrated at the lower end — 72% with education up to 10th grade and none with graduate or postgraduate degrees — severely limiting statistical power to detect education-related knowledge differences. Similarly, the income distribution was predominantly middle-bracket (67% in INR 10,001–30,000), and the occupational composition was heterogeneous, precluding meaningful occupational stratification. The restricted demographic variance inherent in a CHC-based convenience sample likely contributed substantially to the null association findings across all variables.

Correlation between Knowledge and Attitude Regarding EBM Storage

The present study revealed a negligible positive correlation between knowledge and attitude scores regarding expressed breast milk (EBM) storage ($r = 0.019$, $p = 0.851$), indicating that the relationship was not statistically significant. This finding

suggests that participants with higher knowledge scores did not necessarily demonstrate more favourable attitudes towards EBM storage. Similarly, participants with positive attitudes may not necessarily possess adequate factual knowledge regarding recommended storage duration, temperature requirements, handling procedures, and safety precautions. This highlights the distinction between knowledge and attitude as two separate dimensions influencing maternal practices. The findings emphasize that favourable attitudes alone may not be sufficient to ensure safe EBM storage without adequate knowledge and practical understanding. Therefore, maternal health education should incorporate structured knowledge-focused interventions, practical demonstrations, and reinforcement of evidence-based EBM storage guidelines to address potential knowledge gaps and promote safe breast milk handling practices.

Nursing Implications

Nursing Practice: Community health nurses are strategically positioned to provide targeted, structured education on EBM expression and storage during routine postnatal visits. Given that only 20% of participants obtained information from health personnel and that relative constituted the predominant information source (57%) nurses must proactively prioritise EBM counselling as a core component of postnatal care. Group education sessions, individual counselling, and bedside demonstrations can be integrated into existing CHC workflows.

Nursing Education: Nurse educators should strengthen the integration of EBM storage education within maternal and child health nursing curricula, ensuring that future nurses are equipped with current, evidence-based knowledge of EBM expression techniques, storage temperature guidelines, container safety, and warming practices.

Nursing Administration: CHC nursing administrators should establish breastfeeding-friendly institutional policies, including designated time for postnatal lactation consultation, provision of validated self-instructional resources, and organisation of in-service training programmes on lactation support for nursing staff.

Nursing Research: Future researchers should pursue experimental and quasi-experimental designs to evaluate the effectiveness of structured educational interventions including the SIM developed here in improving EBM storage knowledge and practice. Mixed-methods approaches incorporating qualitative data on barriers to knowledge translation would further strengthen the evidence base.

Strengths and Limitations

This study generates novel evidence on EBM storage knowledge and attitude from a CHC setting in Uttar Pradesh, a region with inadequate EBM-related primary data. The use of validated, reliable, bilingual (Hindi and English) research tools, the application of both descriptive and inferential statistical analyses, and the development of a directly usable self-instructional module are notable strengths.

Several limitations warrant acknowledgement. The study was conducted at a single CHC (Gudamba), restricting geographical generalizability. Non-probability purposive sampling introduces

the potential for selection bias, and the absence of a sample size power calculation based on a formally documented effect size is a methodological limitation. The cross-sectional design prohibits causal inference. The interview technique while ensuring completeness of data may have introduced social desirability bias, particularly in attitudes toward breastfeeding.

CONCLUSION

This study demonstrates that the majority of postnatal working mothers attending CHC Gudamba, Lucknow, possessed only average knowledge regarding EBM storage (77%; mean score: 12.04 ± 3.21 out of 25), with only 7% achieving good knowledge and 16% demonstrating poor knowledge. Despite this significant knowledge deficit, 98% demonstrated positive attitudes toward EBM storage (mean score: 25.51 ± 2.15 out of 40). No statistically significant associations were detected between knowledge or attitude and any selected demographic variable ($p > 0.05$ for all). The non-significant knowledge–attitude correlation underscores that positive attitudes do not substitute for adequate knowledge in enabling safe EBM practice. Structured, nurse-led health education interventions are urgently needed at the community level to translate the consistently positive attitudes of working mothers into adequate knowledge and safe EBM storage practices, thereby supporting exclusive breastfeeding continuation and improving infant health outcomes.

CLINICAL AND RESEARCH IMPLICATIONS

Findings support the immediate integration of structured EBM education into routine postnatal care at CHC level. Given that

47% of participants had no workplace break facility for EBM expression and 62% used feeding bottles in their absence, there is an urgent need for policy advocacy to support lactation-friendly workplace environments alongside facility-level educational interventions. The self-instructional module developed in this study can be institutionalised as a standard postnatal discharge resource.

Future studies should employ experimental or quasi-experimental designs with pre- and post-test assessments to evaluate the effectiveness of SIM-based or other structured educational interventions on EBM knowledge and practice. Larger, multicentre, stratified random samples would enable population-level inference. Qualitative investigations should explore barriers to the translation of positive attitudes into knowledge acquisition and practice.

DECLARATIONS

Ethical Approval: Ethical approval was obtained from the Institutional Ethical Committee of St. Mary's College of Nursing, Kursi Road, Lucknow, Uttar Pradesh, India. Written administrative permission was obtained from the concerned authority of Community Health Centre Gudamba, Lucknow, Uttar Pradesh, India.

Informed Consent: Informed consent was obtained from all study participants prior to enrolment.

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Conflict of Interest: The authors declare no conflict of interest.

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