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Nurse educational intervention on breastfeeding-related problems among postnatal mothers in a tertiary health facility in Anambra State, Nigeria

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Abstract

Background: Breastfeeding problems and poor technique contribute to early discontinuation of breastfeeding and neonatal morbidity. Educational interventions that teach proper latch and positioning may reduce breastfeeding-related problems and improve maternal confidence and practices.

Objectives: To determine the effect of a structured educational intervention on breastfeeding-related problems, mothers' knowledge of proper breastfeeding technique, and breastfeeding practices among postnatal mothers at Nnamdi Azikiwe University Teaching Hospital.

Methods: A quasi-experimental pre–post study was conducted among 172 postnatal mothers at NAUTH. Data were collected using a structured questionnaire addressing breastfeeding problems, confidence and knowledge of proper technique, and specific breastfeeding practices. Participants received a standardized breastfeeding education session with demonstrations. Pre-intervention and post-intervention responses were compared using Chi-square and Fisher's Exact tests. Significance was set at $p < 0.05$.

Results: At baseline, 92.4% of mothers reported ≥1 breastfeeding problem; the most common were nipple pain (32.0%), engorgement (26.7%), latching difficulties (17.4%), and low milk supply (16.3%). Most mothers (81.4%) had no formal breastfeeding education, and large knowledge gaps existed about latch signs (79.7% unfamiliar) and positions (74.4% not knowledgeable). After the nurse-led educational intervention, problems fell sharply: 70.3% reported no problems and only 29.7% reported issues. Post-intervention problem rates were nipple pain 9.9%, engorgement 4.1%, latching difficulties 6.4%, and low milk supply 9.3%. Confidence and knowledge improved—90.1% confident, 100% received formal education, 94.2% familiar with latch signs, and 82.6% knew positions. Observed technique reached high levels: 100% correct head–body alignment and holding baby close, universal pillow use, and 90.7% very comfortable with positions. Statistical tests showed significant pre–post improvements in overall problems ($p = 0.008$), frequency ($p < 0.001$), confidence ($p < 0.001$), technique/frequency ($p < 0.001$), and comfort ($p = 0.005$).

Conclusion: The structured educational intervention substantially reduced breastfeeding-related problems and improved mothers' knowledge, confidence, and practical breastfeeding technique. Integrating hands-on breastfeeding education into routine postnatal care and providing follow-up support is recommended to sustain gains and address remaining gaps.

Keywords: Breastfeeding Education; Breastfeeding Technique; Latching and Positioning; Postnatal Mothers; Breastfeeding Problems

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1. Introduction

Breastfeeding delivers essential nutrients and antibodies that protect infants and confer maternal health benefits; exclusive breastfeeding for six months is widely recommended (WHO, 2024; CDC, 2024). Despite these advantages, many mothers experience barriers to initiating or maintaining breastfeeding, including nipple pain, engorgement, and perceived inadequate milk supply, which can prompt early cessation if unaddressed (Gianni et al., 2019; Babakazo et al., 2022; Souza et al., 2020; Thomas, 2016). Insufficient information about technique and management of common problems, together with cultural norms, further undermines breastfeeding success (Arumugam, Pandurangan and Naveena, 2024; Sandhi et al., 2023).

Nurses are central to postnatal care and breastfeeding support; structured, nurse-led educational programs combining demonstration and follow-up have improved maternal knowledge, self-efficacy, and practical skills, and reduced breastfeeding problems in multiple settings (Alruwaythi NMM et al., 2022; Eiser, 2023; Phillips et al., 2018; Nikpour et al., 2020). Effective modalities include visual aids, group instruction, individualized coaching, and telephone follow-up (Sandhi et al., 2023; Arumugam et al., 2024). In Anambra State and other parts of Nigeria, breastfeeding problems such as engorgement and sore nipples are common and compounded by limited provider support, contributing to suboptimal exclusive breastfeeding rates (Akadri and Odelola, 2020; Mulcahy et al., 2022). This study evaluated the effect of a nurse-led educational intervention on breastfeeding problems, knowledge, and technique among postnatal mothers attending a tertiary facility in Anambra State, addressing a gap in local evidence on targeted educational interventions.

2. Methods

2.1. Design and setting

A quasi-experimental one-group pretest–posttest design was used at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, a federal teaching hospital providing comprehensive maternal and child health services.

2.2. Population

The target population comprised postnatal mothers presenting for infant immunization between birth and the 10th postnatal week (NAUTH records, July–September 2023; N = 302).

2.3. Sampling

Using Taro Yamane's formula with e = 0.05 yielded a sample size of 172. Participants were selected by simple random sampling from eligible mothers attending the Human Vaccination Clinic during the study period. Selected mothers formed a single cohort receiving pretest assessment, the nurse-led intervention, and posttest follow-up.

2.4. Inclusion

Inclusion criteria were postnatal mothers attending the clinic within 10 weeks postpartum who consented and could respond in English or the local language.

2.5. Exclusion

Exclusions were refusal of consent and unstable physical or psychiatric conditions preventing participation.

2.6. Instrument for data collection

A researcher-designed structured questionnaire (43 closed items) measured demographics, pre- and post-intervention breastfeeding problems, knowledge of correct breastfeeding technique, and observed technique elements.

2.7. Validity and Reliability of the instrument

Content validity was established by expert review; pilot testing at a similar facility ($n \approx 17$) produced a Cronbach's alpha of 0.83, indicating good reliability.

2.8. Data collection procedure

After baseline assessment, a nurse-led educational module was delivered, incorporating demonstration, supervised practice, individualized feedback, and pamphlet materials. An immediate post-training check ensured comprehension, and a follow-up posttest occurred six weeks later to assess changes in knowledge, observed technique, and

breastfeeding problems. Two trained research assistants supported recruitment and data collection. Data collection lasted ten weeks. The total number of participants assessed was 172.

2.9. Data management and analysis

Questionnaires were checked, coded, entered into Excel, and analyzed using SPSS v25. Descriptive statistics summarized participant characteristics and outcomes. Chi-square and Fisher's Exact tests compared pretest and posttest proportions; statistical significance was set at $p < 0.05$.

2.10. Ethical considerations

Ethical approval was obtained from the NAUTH Research and Ethics Committee. Participants received study information and provided oral/written consent. Confidentiality was maintained by de-identifying data and restricting access to the research team. Participation was voluntary and withdrawal permissible at any time.

3. Results

Table 1 Pre-intervention breastfeeding-related problems among postnatal mothers (n=172)

Pre-intervention breastfeeding problems	Options	Frequency	%
Encountered breastfeeding problems	Yes, I have	159	92.4
	No, I haven't	13	7.6
Total		172	100.0
Types of breastfeeding problem encountered	Engorgement	46	26.7
	Nipple pain	55	32.0
	Latching difficulties	30	17.4
	Low milk supply	28	16.3
	None	13	7.6
Total		172	100.0
Frequency of breastfeeding problems encountered. If you chose no previously, select none	Rarely	0	0
	Occasionally	10	5.8
	Always	149	86.6
	None	13	7.6
Total		172	100.0

Table 1 shows the mothers' pre-educational intervention knowledge about breastfeeding-related problems. Findings revealed that before the educational intervention, 159 (92.4%) reported experiencing at least one breastfeeding-related problem (Table 4.2). The most common problems were: Nipple pain (32.0%), Engorgement (26.7%), Latching difficulties (17.4%), and low milk supply (16.3%). Ninety-three (54.0%) of the respondents experienced the problems frequently.

Table 2 Pre-intervention existing knowledge of proper breastfeeding technique among postnatal mothers (n =172)

Pre-intervention knowledge of mothers	Options	Frequency	%
Confidence about proper breastfeeding technique	Very confident	3	1.7
	Confident	138	80.2
	Neutral	28	16.3
	Not very confident	3	1.7
	Not confident at all	0	0
Total		172	172
Breastfeeding techniques education received	Yes	32	18.6
	No	140	81.4
Total		172	100.0
Familiarity with signs of proper latching	Yes	35	20.3
	No	137	79.7
Total		172	100.0
Breastfeeding positions	Very Knowledgeable	13	7.6
	Somewhat Knowledgeable	31	18.0
	Not Knowledgeable	128	74.4
Total		172	100.0

Table 2 shows the pre-educational intervention and existing knowledge of proper breastfeeding technique. The majority (80.2%) of mothers in this study reported being confident and having received education on proper breastfeeding techniques. Only 32 (18.6% had received formal breastfeeding education, while 140 (81.4%) had not; 79.7% were not familiar with signs of proper latching; 74.4% were not knowledgeable about suitable breastfeeding positions.

Table 3 Pre-intervention breastfeeding technique among postnatal mothers

Pre-intervention breastfeeding technique	Options	Frequency	%
Frequency of breastfeeding	12 times per day	72	41.9
	8 times per day	46	26.7
	4 times per day	37	21.5
	Once a day	0	0.0
	Never	17	9.9
Total		172	100.0
Breastfeeding technique type	Exclusive	97	56.4
	Formula	40	23.3
	None of the above	35	20.3
Total		172	100.0
Comfortability of breastfeeding positions	Very comfortable	0	0
	Somewhat comfortable	73	42.4

	Not comfortable	99	57.6
Total		172	100.0
Use of supporting gadget for relaxation during breastfeeding	Yes	25	14.5
	No	147	85.5
Total		172	100.0
Position of baby in alignment with the breast	Yes	61	35.5
	No	111	64.5
Total		172	100.0
Holding baby close to mother's breast	Yes	130	75.6
	No	42	24.4
Total		172	100.0
Holding baby with nose at same level with nipple	Yes	27	15.7
	No	145	84.3
Total		172	100.0
Holding baby's head tip back a little	Yes	39	22.7
	No	133	77.3
Total		172	100.0

From Table 3, before the intervention, 41.9% of mothers breastfed about 12 times per day, 56.4% reported exclusive breastfeeding, and 57.6% were not comfortable with different breastfeeding positions. The majority of mothers (85.5%) did not use pillows during breastfeeding. Regarding specific technique measures, 64.5% had correct head–body alignment, 75.6% held the baby close and facing the breast, 84.3% positioned the baby's nose level with the nipple, 77.3% allowed the baby's head to tip back slightly, and 75.0% rated their own technique as "good."

Table 4 Post-intervention breastfeeding-related problem (n=172)

Post-intervention Breastfeeding Problems	**Options**	**Frequency**	**%**
Encountered breastfeeding problems	Yes, I have	51	29.7
	No, I haven't	121	70.3
Total		172	100.0
Types of breastfeeding problem encountered	Engorgement	7	4.1
	Nipple pain	17	9.9
	Latching difficult	11	6.4
	Low milk supply	16	9.3
	Mastitis	0	0
	None	121	70.3
Total		172	100.0
Frequency of breastfeeding problems encountered. If you chose no, previously select none	Rarely	45	26.2
	Occasionally	6	3.5
	Frequently	0	0

	Always	0	0
	None	121	70.3
Total		172	100.0

Table 4 shows that after the educational intervention, 70.3% reported no breastfeeding problems, while 29.7% reported one or more problems; the specific problems reported post-intervention were nipple pain in 9.9%, engorgement in 4.1%, latching difficulties in 6.4%, and low milk supply in 9.3%.

Table 5 Post-intervention existing knowledge of proper breastfeeding technique among postnatal mothers

Post-intervention knowledge of mothers	**Options**	**Frequency**	**%**
Confidence about proper breastfeeding technique	Very confident	155	90.1
	Confident	17	9.9
	Neutral	0	0.0
	Not very confident	0	0.0
	Not confident at all	0	0.0
Total		172	100.0
Breastfeeding techniques education received	Yes	172	100.0
	No	0	0.0
Total		172	100.0
Familiarity with signs of proper latching	Yes	162	94.2
	No	10	5.8
Total		172	100.0
Breastfeeding positions	Very Knowledgeable	142	82.6
	Somewhat Knowledgeable	30	17.4
	Not Knowledgeable	0	0.0
Total		172	100.0

Post-intervention, 90.1% of mothers indicated confidence in their knowledge about breastfeeding technique; all (100%) reported having received formal breastfeeding education as part of the intervention, 94.2% were familiar with signs of proper latching, and 82.6% were knowledgeable about breastfeeding positions (Table 5).

Table 6 Post-intervention breastfeeding technique among postnatal mothers

Post-intervention breastfeeding technique	Options	Frequency	%
Frequency of breastfeeding	12 times per day	154	89.5
	8 times per day	0	0
	4 times per day	0	0
	Once a day	0	0
	Never	18	10.4
Total		172	100.0
Breastfeeding technique type	Exclusive	88	50.2
	Formula	57	32.1
	None of the above	27	15.7
Total		172	100.0
Comfortability of breastfeeding positions	Very comfortable	156	90.7
	Somewhat comfortable	5	2.9
	Not comfortable	11	6.4
Total		172	100.0
Use of supporting gadget for relaxation during breastfeeding	Yes	172	100.0
	No	0	0.0
Total		172	100.0
Position of baby in alignment with the breast	Yes	172	100.0
	No	0	0.0
Total		172	100.0
Holding baby close to mother's breast	Yes	172	100.0
	No	0	0.0
Total		172	100.0
Holding baby with nose at same level as nipple	Yes	172	100.0
	No	0.0	0.0
Total		172	100.0
Holding baby's head tipped back a little	Yes	171	99.4
	No	1	0.6
Total		172	100.0

Table 6 shows that after the educational intervention, 89.5% of mothers breastfed about 12 times per day, 50.2% reported exclusive breastfeeding, and 90.7% were very comfortable with different breastfeeding positions; all 100% used pillows during breastfeeding. Technique elements reached optimal levels for nearly all mothers: head–body straight alignment, holding the baby close and facing the breast, and positioning the nose level with the nipple were each observed in 100% of the participants, while allowing the head to tip back slightly was observed in 99.4%; 63.4% rated their own technique as "very good."

Table 7 Association pre and post educational intervention breastfeeding related problems, mothers' knowledge and practice of proper breastfeeding technique

Breastfeeding Problems	**Options**	**Frequency/Percentages**		**Chi-square (p-value)**
		Pre intervention	Post intervention	
Encountered breastfeeding problems.	Yes, I have	159(92.4)	51(29.7)	5.927 (0.008)
	No, I haven't	13(7.6)	121(70.3)	
Frequency of breastfeeding problems encountered. If you chose no, previously select none				Fisher's Exact Test (p-value)
	Rarely	0(0)	45(26.2)	28.746(0.000)
	Occasionally	10(5.8)	6(3.5)	
	Frequently	93(54)	0(0)	
	Always	56(32.6)	0(0)	
	None	13(7.6)	121(70.3)	
Mothers' Knowledge of proper breastfeeding techniques				
Confidence about proper breastfeeding technique	Very confident	3(1.7)	155(90.1)	58.487(0.000)
	Neutral	28(16.3)	0(0)	
	Not very confident	3(1.7)	0(0)	
	Not confident at all	0(0)	0(0)	
				Chi-square(p-value)
Familiarity with signs of proper latching	Yes	35(20.3)	162(94.2)	2.712(0.127)
	No	137(79.7)	10(5.80)	
Breastfeeding positions	Very Knowledgeable	13(7.6)	142(82.6)	12.491(0.003)
	Somewhat Knowledgeable	31(18.0)	30(17.40	
	Not Knowledgeable	128(74.4)	0(0)	
Breastfeeding Technique				Fisher's Exact Test (p-value)
Frequency of breastfeeding	12 times per day	72(41.9)	154(89.5)	95.642(0.000)
	8 times per day	46(26.7)	0(0)	
	4 times per day	37(21.5)	0(0)	
	Once a day	0(0)	0(0)	
	Never	17(9.9)	18(10.4)	
				Chi-square(p-value)
Breastfeeding technique type	Exclusive	97(56.4)	88(50.2)	197.657(0.000)
	Formula	40(23.3)	57(32.1)	
	None of the above	35(20.3)	27(15.7)	

Comfortability of breastfeeding positions	Very comfortable	0(0)	156(90.7)	Fisher's Exact Test (p-value
	Somewhat comfortable	73(42.4)	5(2.9)	9.575(0.005)
	Not comfortable	99(57.6)	11(6.4)	
Holding baby's head tip back a little	Yes	39(22.7)	171(99.4)	Chi-square(p-value)
	No	133(77.3)	1(0.6)	0.295(1.000)

P <0.05

The chi-square test in Table 7 showed a significant difference in breastfeeding problems encountered before and after the intervention (P = 0.008), and Fisher's Exact test likewise showed a significant difference in the frequency of breastfeeding problems reported by mothers pre- versus post-intervention (P = 0.000).

There was a significant improvement in mothers' confidence about breastfeeding technique (Fisher's Exact p < 0.001) and in knowledge of breastfeeding positions (Chi-square p = 0.003), while familiarity with signs of proper latching did not reach statistical significance by Chi-square (p = 0.127). Overall knowledge improved, with particularly strong evidence for increased confidence and position knowledge; although familiarity with latching signs rose in raw percentages (from 79.7% unfamiliar pre-intervention to 94.2% familiar post-intervention), the Chi-square result was not significant, which may reflect sample distribution, small cell counts, or the choice of test (Fisher's Exact might yield a different result).

The frequency of breastfeeding changed significantly after the intervention (Fisher's Exact p < 0.001), the overall type of breastfeeding technique showed a significant change (Chi-square p < 0.001), and comfort with breastfeeding positions improved significantly (Fisher's Exact p = 0.005); however, there was no significant change in the practice of allowing the baby's head to tip back a little (Chi-square p = 1.000). These results indicate the intervention significantly improved most practice and technique measures, with the lack of change on the head-tip item likely due to a ceiling effect because performance on that item was already high (77.3%) before the intervention.

4. Discussion

More than half of mothers reported breastfeeding problems before the educational intervention, with nipple pain being most common, followed by engorgement, latching difficulties, and perceived low milk supply (Table 1). The baseline prevalence of breastfeeding problems was extremely high: 92.4% of mothers reported pain, and 86.6% reported problems frequently or always. These figures reveal substantial unmet needs for breastfeeding support at baseline and provide a clear rationale for an intervention emphasizing correct latch, positioning, techniques for breast emptying, and early recognition and management of engorgement and nipple trauma.

The predominance of nipple pain and engorgement suggests primarily mechanical origins, most likely ineffective latch and suboptimal positioning that prevent timely and complete milk removal. This explanation aligns with existing literature: Babakazo et al. (2022) documented cracked/sore nipples, perceived low milk, and engorgement as common lactation problems; Wambach and Riordan (2016) identified improper latch as a frequent cause of nipple related barriers to breastfeeding; and Huggins and Zorc (2015) linked engorgement with nipple pain and subsequent breastfeeding difficulties.

Low perceived milk supply can further exacerbate nipple trauma because frustrated infants may feed more aggressively, increasing friction and injury; Brown et al. (2020) linked nipple pain to broader breastfeeding difficulties and early cessation. Untreated nipple pain carries important downstream implications: it increases the risk of maternal anxiety and depression, reduces breastfeeding frequency because mothers avoid painful nursing, and can initiate a cycle of milk stasis and worsening engorgement that accelerates weaning.

At baseline, self-reported confidence in breastfeeding technique appeared relatively high: 80.2% reported some confidence, but only 1.7% were "very confident," and most mothers (81.4%) had no formal education. Objective knowledge was poor: 79.7% were unfamiliar with signs of effective latch and 74.4% lacked knowledge of suitable positions (Table 2). Although many mothers reported confidence, objective knowledge was limited, indicating that confidence may stem from informal guidance or assumptions rather than evidence-based training, a pattern also observed by Olayemi et al. (2023). Smith et al. (2022) similarly identified limited access to breastfeeding education as

a barrier to achieving exclusive breastfeeding targets. Conversely, mothers with formal education in other studies were more likely to demonstrate correct techniques and greater knowledge of latch and positions (Spear et al., 2019; Lawrence and Lawrence, 2022).

Observed breastfeeding practices showed strengths and gaps. Most mothers breastfed frequently (approximately 12 times/day), and many practiced exclusive breastfeeding, aligning with WHO recommendations for establishing supply. However, more than half reported discomfort with positions; most did not use pillows; and although 75% rated their technique as "good," detailed observation revealed persistent technical gaps (Table 3). Several technique elements were present in a majority (e.g., holding the baby close, nose to nipple alignment), but poor comfort and lack of ergonomic supports likely contributed to pain, engorgement, and latching problems. This discrepancy between self-rated competence and observed deficiencies echoes Smith et al. (2022), who documented mothers' tendency to overestimate competence without structured instruction. Rao et al. (2022) and Feldman Winter et al. (2020) emphasize that correct positioning, latch, and tools such as pillows improve comfort, reduce nipple trauma, and enhance milk transfer.

Following the nurse-led educational intervention, breastfeeding problems declined markedly. Overall reported problems fell from 92.4% to 29.7% (Table 4), with highly significant changes in both type ($p = 0.008$) and frequency ($p = 0.000$) of problems encountered. The intervention's focus on hands-on demonstration of proper latch and positioning, instruction on frequent feeding and effective breast emptying, and early recognition and treatment of engorgement and nipple trauma provides a plausible mechanism for these reductions. Similar reductions have been documented in the literature: Phillips et al. (2018) and Nikpour et al. (2020) found nurse education improved breastfeeding rates, decreased complications, and enhanced maternal mental health and self-care. Chapman and Perez Escamilla (2018) reported that nursing interventions substantially decrease nipple pain and improve latch technique across diverse populations.

The intervention produced large gains in both subjective and objective knowledge indicators. Post intervention, 90.1% of mothers reported confidence in their technique; 100% had received formal breastfeeding education as part of the program; 94.2% were familiar with signs of a proper latch; and 82.6% were knowledgeable about breastfeeding positions (Table 5). These increases—from a baseline of 20.3% recognizing latch signs and 25.6% knowing positions to the substantially higher post intervention levels suggest that structured programs combining demonstration and practice effectively bridge knowledge gaps. Kim et al. (2023) reported similar improvements in maternal confidence and knowledge following interactive education, and the WHO (2023) reiterates the importance of structured education for equipping mothers with practical breastfeeding skills. The 57 percentage point increase in position knowledge accords with Rao et al. (2022), who showed that familiarity with multiple positions allows mothers to adapt to infant and maternal needs, improving comfort and prolonging breastfeeding.

Behavioral and technical measures improved to near universal levels after education, with several items reaching 100%. Comfort with positions shifted dramatically: pre-intervention, most mothers were uncomfortable, while post intervention 90.7% reported being "very comfortable," and pillow use became universal (previously 14.5%). These objective changes plausibly account for the reduction in problems: improved positioning and ergonomic support reduce physical strain, enable deeper latches, and improve milk removal—thereby preventing engorgement and nipple trauma. Nanthini and Bhuvaneswari (2015) found that positioning education lowers risks of sore and bleeding nipples; Feldman Winter et al. (2020) emphasized that pillows and positioning aids significantly enhance maternal comfort and breastfeeding success.

One unexpected finding was a slight decline in exclusive breastfeeding rates—from 56.4% pre-intervention to 50.2% post intervention. This decrease may reflect timing or reporting differences, changes in maternal circumstances (for example, return to work), or short-term shifts unrelated to the intervention itself; it warrants further investigation. Overall, however, the intervention's positive effects on technique and problem reduction are robust.

The study tested three hypotheses examining differences between pre and post intervention outcomes in breastfeeding problems, knowledge of technique, and breastfeeding practice/technique. For the first hypothesis, the difference in breastfeeding problems. Statistical tests supported a significant intervention effect. The chi-square test for problem types ($p = 0.008$) and Fisher's Exact test for problem frequency ($p = 0.000$) indicate significant changes in both the distribution and frequency of problems encountered. The absolute reduction from 92.4% to 29.7% (a 62.7 percentage point decline) is substantial and consistent with the literature showing hands-on education, demonstration, and follow-up support produce the largest reductions in breastfeeding complications (Phillips et al., 2018; Nikpour et al., 2020).

For the second hypothesis, changes in knowledge across three domains (confidence, latch sign recognition, and position knowledge) results were mixed. Fisher's Exact test showed a highly significant improvement in confidence ($p = 0.000$),

with confidence rising from 80.2% (only 1.7% very confident) to 90.1% post intervention. This gain likely reflects the hands-on practice and immediate feedback inherent in the program; increased maternal self-efficacy is important because it sustains breastfeeding persistence and promotes help-seeking when problems occur. Although the chi-square test for familiarity with latch signs did not reach conventional significance ($p = 0.127$), the raw increase from 20.3% to 94.2% is clinically meaningful and aligns with evidence that education improves mothers' ability to detect effective latch and milk transfer (Kent et al., 2012). Knowledge of positions improved significantly ($p = 0.003$), with a notable absolute increase from 25.6% to 82.6%, reflecting the effectiveness of demonstration and practice for teaching multiple holds (cradle, cross cradle, football, side lying). This breadth of positional knowledge equips mothers to manage engorgement, infant size, and maternal fatigue, and promotes sustained breastfeeding (Lawrence and Lawrence, 2022).

The third hypothesis examined changes in breastfeeding technique across four domains: frequency of breastfeeding, type of technique, comfort with positions, and the practice of holding the baby's head tipped back slightly. Fisher's Exact test showed a significant improvement in frequency ($p = 0.000$): mothers reporting approximately 12 feeds per day rose from 41.9% pre-intervention to 89.5% post intervention, a 47.6 percentage point increase. Increased feeding frequency is physiologically important because frequent milk removal upregulates prolactin receptor activity and establishes supply, while infrequent feeding downregulates production and contributes to perceived low supply. The type of technique adopted changed significantly ($p = 0.000$), with multiple technique elements (head/body alignment, holding baby close facing the breast, nose level with nipple) reaching 100% post intervention—an outcome attributed to in-session practice and coaching enabling comprehensive skill acquisition. Comfort with positions also improved significantly ($p = 0.005$), reversing the pre-intervention pattern of discomfort; factors contributing to increased comfort included skill learning, universal pillow use, and increased confidence.

The practice of holding the infant's head tipped back slightly did not show a statistically significant change (chi-square $p = 1.000$). This is best explained by a high baseline performance (77.3%) that rose to near universal practice (99.4%) after the intervention, leaving little scope for a detectable statistical difference despite a sizeable absolute improvement. The strong pre-intervention uptake may reflect intuitive maternal behavior or prior informal guidance on the natural latch reflex.

Overall, the pattern of results supports a causal interpretation in which a nurse-led, hands-on educational intervention materially improved mothers' breastfeeding skills and confidence, increased feeding frequency, reduced mechanical causes of nipple trauma and engorgement, and therefore sharply reduced the prevalence and frequency of breastfeeding problems. The magnitude and domains of improvement align with prior randomized and observational studies (Nikpour et al., 2020; Chapman and Perez Escamilla, 2018; Kim et al., 2023; Phillips et al., 2018) that show structured education, particularly when it includes demonstration, practice, and follow-up, produces the largest benefits.

5. Conclusion

Overall, the educational intervention was effective. It increased formal breastfeeding education exposure, substantially improved mothers' confidence and knowledge (particularly about positions), and enhanced multiple practical aspects of breastfeeding technique, and these gains coincided with a large reduction in reported breastfeeding problems from 92.4% pre-intervention to 29.7% post intervention and with declines in specific complications such as nipple pain, engorgement, and latching difficulties.

Recommendations

Recommended actions are to integrate the educational programme into routine postnatal care with hands on practice, observation, and scheduled follow up to reinforce skills; add targeted modules addressing residual problems (for example, low milk supply and persistent nipple pain) and barriers to exclusive breastfeeding; use objective observational assessments by trained personnel at multiple postpartum timepoints to validate self-reports; and in future studies clarify timing of measurements and investigate reasons for the post intervention decline in exclusive breastfeeding.

Strengths

Strengths of the study include a clear pre–post design, assessment across multiple outcome domains (problems, knowledge, and practices), and use of appropriate statistical tests (Chi-square and Fisher's Exact), which together support the conclusion that the intervention made a meaningful difference.

Limitations

Major limitations and considerations include some inconsistent findings—most notably a slight decrease in reported exclusive breastfeeding post intervention and one knowledge item (familiarity with latching signs) that, despite large raw improvements, did not reach statistical significance on the Chi square test—which warrant investigation of measurement timing, question wording, and small cell counts; possible social desirability bias, since trained mothers may overreport favorable behaviors or competence; and short term follow up, because measures collected soon after training may not reflect longer term retention.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declared no potential conflict of interest.

Statement of ethical approval

Approval to conduct the study was given by the Ethics and Research Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Authors' contributions

All authors were involved in the conception of the research idea, design, and implementation of the project. CCHO, ONI, and VCO reviewed the literature. ONI did data collection and data entry. VCO wrote the first draft of the manuscript. CCHO critically reviewed the manuscript. CCHO wrote the final manuscript. All authors read and approved the final manuscript and this submission.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon request.

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