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Implementation Of Culture-Based Peer Educators To Improve Husbands' Roles In Supporting Exclusive Breastfeeding Among The Angkola Batak Ethnic Group

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ABSTRACT

Background: Exclusive breastfeeding is influenced not only by maternal factors but also by husbands' knowledge, attitudes, and practical support. This study developed and evaluated an Angkola Batak culture-based peer educator intervention to strengthen husbands' support for exclusive breastfeeding.

Methods: An explanatory sequential mixed-method design was used. The qualitative phase involved three husbands as primary informants and seven key informants consisting of traditional, religious, and community leaders. Findings from the qualitative phase informed the development of a culturally adapted peer educator module. The quantitative phase used a quasi-experimental pretest-posttest control-group design involving 80 husbands, with 40 in the intervention group and 40 in the control group. Outcomes included knowledge, attitude, action, and domains of husband support. Exclusive breastfeeding was monitored monthly for six months. Within-group changes were assessed using paired statistical tests, while between-group comparisons used the Mann-Whitney U test. Effect sizes and 95% confidence intervals were reported where estimable.

Results: The intervention group demonstrated significant improvements across the measured husband-support outcomes, with large effects for the principal behavioral outcomes. At six months, 32 of 40 mothers (80.0%) in the intervention group sustained exclusive breastfeeding through six months compared with 15 of 40 (37.5%) in the control group. The risk ratio was 2.13 (95% CI 1.39–3.28), the risk difference was 42.5 percentage points (95% CI 23.0–62.0), and the odds ratio was 6.67 (95% CI 2.44–18.21). The month-six checklist status was treated as a separate measure from sustained breastfeeding across the entire six-month period to avoid conflating two different outcome definitions.

Conclusion: An Angkola Batak culture-based peer educator intervention was associated with improved husbands' support and a higher proportion of sustained exclusive breastfeeding. The findings support culturally responsive peer education as a potentially useful strategy for strengthening family support for breastfeeding. Because the study used a quasi-experimental design and did not formally account for peer-educator clustering or longitudinal repeated measurements in the primary analysis, the findings should be interpreted as an observed association rather than definitive causation.

INTRODUCTION (CHAPTER)

Exclusive breastfeeding is a crucial component in improving maternal and child health. Exclusive breastfeeding, recommended for the first six months of life, has been shown to reduce the risk of infant mortality, improve immunity, and support optimal infant growth and development. The WHO and UNICEF

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state that approximately two-thirds of under-five deaths occur during infancy, with most linked to poor feeding practices. (1). The practice of exclusive breastfeeding can reduce neonatal mortality by up to 22%. (2). However, exclusive breastfeeding coverage in Indonesia is still not optimal. Based on the 2023 *Global Breastfeeding Scorecard* , only 42% of infants under six months are exclusively breastfed, far from the 2025 *World Health Assembly target* of 50% (Lubis et al., 2023). In North Sumatra Province alone, exclusive breastfeeding coverage reached 57.88% in 2021 and decreased to 49.77% in 2023. Padangsidimpuan City is among the 10 districts/cities with the lowest coverage, at only 37.7%. (3).

One factor contributing to the low coverage of exclusive breastfeeding is a lack of support from husbands for their wives during breastfeeding. Husbandly support has been shown to be a determining factor in successful breastfeeding, both in the form of emotional support, information, and practical assistance (6,7). An Australian study showed that breastfeeding success up to six months increased 1.5-fold if supported by a husband. (8). Support from the husband also has an impact on the mother's mental health and the prevention of postpartum depression. (9). However, in patriarchal societies like the Batak Angkola, husbands' involvement in childcare and exclusive breastfeeding is often limited. A strong patriarchal culture positions men as the primary authority and decision-makers in the family, while women are burdened with more domestic and reproductive responsibilities. (10). This is reinforced by the *dalihan na tolu kinship system* in Batak society , which divides social roles into three elements: *mora* (giver of girls), *kahanggi* (clan group), and anak boru (receiver of girls). (11).

Kinship itself is closely linked to birth, and birth fosters kinship both vertically and horizontally. Birth determines a person's position in the Toba Batak social system. (12). Tarombo or family tree is quite important in the Toba Batak community, they highly value their clan or lineage. From that clan, a person's position within the family group and society is determined based on the principle of *Dalihan Na Tolu* . In Batak society, there is a term called mangupa-upa which means gratitude. The Mangupa-upa tradition in Batak culture is a ceremony expressing gratitude from a Batak family or community for the blessings received. (13). The *Mangupa-upa ceremony* is usually performed at births, weddings, achievements, returning to one's hometown, and other occasions. In addition to expressing gratitude, this tradition includes advice and prayers from parents or elders in the Batak community in North Sumatra (14). The Batak tradition of mangupa lahiron daganak (childbirth) involves the presence of a paroppa (ulos, or long cloth). The festivities are also accompanied by salawat (prayer offerings), barjanjzi (prayer offerings), and prayers for the baby and family. In addition, offerings are prepared, including food, which will be used to convey messages (makkobar/mandokkon hata) (15).

A culture-based approach by integrating the mangupa lahiran daganak tradition, especially in the *makkobar* (giving advice) procession which utilizes sacred cultural space as a medium for conveying health messages through the involvement of peer educators among husbands (16). *Peer educators* are individuals from the same social group who have been trained to convey information and serve as role models in behavioral change (17). The advantage of this method lies in the emotional closeness and shared experiences between educators and the target group, making the message more easily accepted. Research shows that the role of *peer educators* can increase understanding, motivation, and compliance in health practices, including breastfeeding (18,19). However, in societies with strong patriarchal values, *peer educators* need to be equipped with a deep cultural understanding to adapt their approaches to local norms and social structures. Developing a culture-based *peer educator training module, specifically dalihan na tolu,* is essential to ensure that educational approaches do not conflict with values respected by the community but instead leverage the strengths of that culture to drive positive change.

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METHOD

This study employed an *exploratory sequential mixed-methods* design, beginning with a qualitative phase, followed by module development and a quantitative quasi-experimental phase. The qualitative findings were used to identify culturally relevant educational needs, construct the intervention, and define the outcomes assessed in the quantitative phase (20,21).

Qualitative phase. A phenomenological qualitative study was conducted in Padangsidimpuan City during February–March 2024. Ten informants were purposively selected: three husbands who had children served as the primary participants because the study sought to understand husbands' experiences and culturally shaped roles in supporting breastfeeding; three traditional leaders, two religious leaders, and two community leaders served as key informants for source triangulation. The article does not document a separate eligibility matrix or formal sampling calculation for the seven key informants; their inclusion was based on their relevant community, cultural, or religious roles and presumed knowledge of family practices. The three husbands provided direct accounts of husbands' experiences, whereas the seven key informants provided contextual and indirect perspectives on husbands' roles. This distinction was maintained during interpretation(22,23).

Module development and validation. The qualitative themes were used to develop the Angkola Batak Culture-Based Peer Education Module for Breastfeeding Fathers. The module comprised five learning units covering eight topics: knowledge of exclusive breastfeeding, balanced nutrition for breastfeeding mothers, expressed breast milk, oxytocin massage, breastfeeding technique, infant burping technique, breast self-examination, and culturally based media on the father's role. Angkola Batak language, the mangupa, makkobar, and paroppa traditions, and values of mutual assistance and kinship were integrated into the module. Three experts evaluated the module: a physician and maternal-child nutrition expert, a midwife and lactation counselor, and a cultural anthropology expert. The reported feasibility scores were 85% for the cultural expert and 84.8% for each medical expert. The original study materials do not identify these percentages as a named content-validity index such as CVI or Aiken's V; therefore, the scores are reported descriptively rather than reclassified under an unreported index. The manuscript also did not prespecify a named validity threshold, so no additional threshold has been inferred. A small-group trial was conducted among 10 husbands of primigravida women who were not included in either study group. Mean ratings on a four-point scale were 3.20 for ease of use, 3.31 for usefulness, 3.20 for trust, and 3.33 for intention to use. The module was revised by simplifying the language and adding a glossary and bilingual Indonesian-Angkola Batak comics. Fidelity of intervention delivery was not formally assessed using a session checklist, observation score, or other fidelity measure; this is acknowledged as a limitation.

Quantitative phase. A quasi-experimental pretest-posttest control-group design was conducted among 80 husbands of third-trimester primigravida women in Padangsidimpuan City, with 40 participants in the intervention group and 40 in the control group. Because the study was quasi-experimental rather than randomized, allocation was non-random and was based on the study site/service area used for recruitment; participants were not individually randomized. Ten husband peer educators were recruited and trained in four structured sessions over one month. Intervention participants received education and mentoring from peer educators using the culture-based module and the Maternal and Child Health Handbook; mentoring continued once per month for six months, with each meeting lasting approximately 30 minutes. Control participants received standard education through the Maternal and Child Health Handbook only. Pretest measurements were obtained before the intervention, exclusive breastfeeding was monitored once each month for six months, and posttest measurements were completed after six months. The quantitative analysis treated the month-six checklist score as a cross-sectional secondary outcome and treated uninterrupted exclusive breastfeeding from birth through six months as the primary sustained outcome (24).

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Data were collected using researcher-developed questionnaires and structured checklists based on the study framework and relevant literature. The instruments assessed husbands' knowledge, attitude, action, and role in supporting exclusive breastfeeding. The husband's role was operationalized as the extent to which husbands provided informational, emotional, physical, and appraisal support to breastfeeding mothers.Knowledge was assessed using 14 multiple-choice items. Each correct answer was scored 1, while an incorrect or "do not know" answer was scored 0, yielding a total score of 0–14. Knowledge was categorized as good when the score was ≥80% of the maximum score. Attitude was assessed using 10 items with five ordered response options, scored from 1 (least favorable) to 5 (most favorable), yielding a total score of 10–50. Scores at or above the group mean were categorized as positive. Action was assessed using 10 items with four- or five-level ordered frequency and participation responses. Responses were coded from the least to the most active behavior, summed, and converted to a percentage of the maximum possible score. Action was categorized as active when the score was ≥80% of the maximum possible score (25).

The husband's supportive role was measured using a 20-item researcher-developed checklist comprising four dimensions: emotional support (4 items; score range 0–4), physical support (6 items; score range 0–6), informational support (5 items; score range 0–5), and appraisal support (5 items; score range 0–5). Each favorable response was scored 1 and each unfavorable response was scored 0. Negatively worded items were reverse-scored. Each support dimension was categorized as good when the score was ≥80% of the maximum possible score and poor when the score was <80%. Higher continuous scores indicated greater levels of knowledge, positive attitude, active behavior, and husband support.

Instrument validity and reliability. The final knowledge questionnaire was pilot-tested among 10 husbands of pregnant women at Sayurmatinggi Health Center. Construct validity was examined using SPSS; all knowledge items were valid because each item had an item-correlation coefficient greater than the critical value and $p \leq 0.05$. The knowledge questionnaire had a Cronbach's alpha of 0.739, indicating acceptable internal consistency. This study did not establish or report separate reliability coefficients for the attitude, action, or husband-support domains. Accordingly, internal consistency for these researcher-developed scales could not be verified retrospectively from the information available in the manuscript and is acknowledged as a measurement limitation.

Exclusive-breastfeeding outcome. The primary outcome was sustained exclusive breastfeeding, defined as giving the infant only breast milk from birth through six months without additional food or drink. It was determined from monthly maternal reports across six observations. A separate three-item monthly checklist assessed exclusive-breastfeeding status for each individual month. Each item consistent with exclusive breastfeeding was scored 1 and the formula item was reverse-scored, yielding a monthly score of 0–3. A score of 3 indicated that the infant met the checklist criteria for exclusive breastfeeding during that specific month. Thus, a month-six checklist score of 3 is not equivalent to uninterrupted maintenance across all six months. Sustained exclusive breastfeeding required a successful checklist classification at every monthly assessment from month 1 through month 6. Breastfeeding-session frequency was not measured (26).

Statistical analysis. Analyses were conducted using SPSS; the exact software version was not retained in the current manuscript and should be verified from the original analysis record before resubmission. Descriptive statistics summarized participant characteristics and outcome scores. The Shapiro-Wilk test was used to assess normality separately by group and outcome. Within the intervention group, pretest-posttest changes in knowledge and the four support domains were analyzed using the Wilcoxon signed-rank test, whereas attitude and action were analyzed using paired-samples t-tests because their score distributions met the normality criterion. Within the control group, all pretest-posttest comparisons used the Wilcoxon signed-rank test because the distributions were non-normal. Between-

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group comparisons of posttest scores were performed using the Mann-Whitney U test, with one p-value reported for each outcome comparing the intervention and control groups at posttest. The month-six checklist status was likewise compared between groups with a single Mann-Whitney U p-value. For the sustained exclusive-breastfeeding outcome, risk difference, risk ratio, odds ratio, and Fisher's exact test were additionally reported. Effect sizes were reported as $r=|Z|/\sqrt{n}$ for Wilcoxon tests and $dz=|t|/\sqrt{n}$ for paired t-tests; standardized mean differences are presented descriptively where appropriate. Ninety-five percent confidence intervals were reported for the sustained binary outcome and for descriptive between-group mean differences where calculable from the available summary statistics. Paired-change confidence intervals could not be reconstructed from the manuscript because participant-level paired difference data and their standard deviations were not reported; no values were imputed. Because multiple within-group hypothesis tests were performed, Holm adjustment was considered in sensitivity interpretation; all intervention-group results reported as $p<0.001$ remained statistically significant after adjustment, whereas control-group results remained non-significant. The 10 peer educators created clustering of approximately four intervention participants per educator. No intraclass correlation coefficient or multilevel adjustment was available in the current analysis, so clustering is treated as a limitation and the estimates should be interpreted cautiously. Monthly observations were used to determine the sustained six-month outcome, but no longitudinal GEE or mixed-effects model was fitted to the six repeated observations; this is also acknowledged as a limitation. Statistical significance was set at $p\leq0.05$.

RESULTS AND DISCUSSION

Qualitative findings. Individual in-depth interviews were completed with 10 informants. Three cultural themes were identified. First, childbirth traditions that could support breastfeeding included the *dalihan na tolu* kinship network, advice and prayer through *makkobar*, food-giving through *mangupa*, and the presentation of a long cloth or *paroppa*. Second, inhibiting cultural values included taboos against breastfeeding near a father-in-law or with the breast visible, social stigma toward husbands performing domestic work, and practices of giving sugar or salt to infants. Third, community expectations emphasized support from husbands, the *dalihan na tolu* family network, and health workers. Two educational-needs themes were also identified: husbands needed information about the benefits and sources of information on exclusive breastfeeding, and practical skills in emotional, physical, informational, and appraisal support. These findings formed the content and delivery strategy of the peer education module. Informant characteristics are presented in Table 1.

Table 1. Respondent Characteristics

No	Initials	Age (year)	Work	Education
1	P1	70	Retired civil servant	Bachelor's degree
2	P2	60	Civil servant	Bachelor's degree
3	P3	45	Religious Affairs Office	Bachelor's degree
4	P4	50	Indonesian Ulema Council	Master's degree
5	P5	45	Neighborhood head	Bachelor's degree
6	P6	54	Urban village head	Bachelor's degree
7	P7	48	Self-employed	Senior high school
8	P8	28	Civil servant	Bachelor's degree
9	P9	42	Self-employed	Bachelor's degree
10	P10	34	Self-employed	Senior high school

The qualitative informants comprised three husbands, three traditional leaders, two religious leaders, and two community leaders residing in Padangsidimpuan City. Their ages ranged from 28 to 70 years. Educational attainment ranged from senior high school to a master's

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degree. Table 1 describes the qualitative informants only; it is not a baseline table for the 80 participants in the quantitative quasi-experimental phase.

Baseline characteristics of quantitative participants

Baseline comparability is essential because participants were not individually randomized. The current manuscript does not contain the participant-level demographic/socioeconomic summary needed to populate this table. The table is therefore retained as a reporting requirement and must be completed from the original quantitative dataset before resubmission; no values were imputed.

Table 2. Characteristics of Respondents in the Intervention Group and Control Group

Variable	Category	Intervention Group (n=40)		Control Group (n=40)		p-value
		f	%	f	%	
Husband's Education	SD (Elementary School)	3	7.5	1	2.5	
	SMP (Junior High School)	9	22.5	10	25	
	SMA equivalent (General)	23	57.5	20	50	0.317
	D3 (Diploma)	1	2.5	3	7.5	
	S1 (Bachelor's Degree)	4	10	6	15	
Husband's Occupation	Entrepreneur	8	20	21	52.5	
	Laborer	29	72.5	8	20	0.078
	Farmer	3	7.5	9	22.5	
	PNS (Civil Servant)	0	0	2	5	
Husband's Income	< 1 million rupiah	13	32.5	4	10	
	1-2 million rupiah	17	42.5	24	60	0.079
	≥ 2 million rupiah	10	25	12	30	
Mother's Education	SD (Elementary School)	3	7.5	6	15	
	SMP (Junior High School)	3	7.5	5	12.5	
	SMA equivalent (General)	28	70	19	47.5	0.921
	D3 (Diploma)	1	2.5	2	5	
	S1 (Bachelor's Degree)	5	12.5	8	20	
Mother's Occupation	IRT (Housewife)	32	80	29	72.5	
	Laborer	1	2.5	5	12.5	
	Entrepreneur	6	15	1	2.5	0.389
	Farmer	1	2.5	4	10	
	PNS (Civil Servant)	0	0	1	2.5	
Mother's Income	< 1 million rupiah	32	80	33	82.5	
	1-2 million rupiah	8	20	4	10	0.659
	> 2 million rupiah	0	0	3	7.5	
Husband's Age	Min-Max / SD	27-55	4.088	22-40	27.30	3.969
Mother's Age	Min-Max / SD	28-33	5.308	20-43	28.15	5.260

Table 2 The data presented the characteristics of the respondents in this study, indicating that the socio-demographic composition of the intervention and control groups was relatively balanced. There were no statistically significant differences in the education, occupation, and income variables for either husbands or mothers, as indicated by p-values >0.05 across all categories tested. Regarding husbands' education, the majority of respondents in both groups had a high school diploma or equivalent (57.5% in the intervention group; 50% in the control group). This proportion indicates a dominant secondary

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education level and can provide a sufficient basis for receiving educational information. Mothers' education was also dominated by high school graduates or equivalent, with 70% in the intervention group and 47.5% in the control group, with a p-value of 0.921, indicating equality between the two groups.

In terms of husbands' occupations, the majority worked as laborers in the intervention group (72.5%), while the majority worked as self-employed in the control group (52.5%). Although there was variation in the distribution of these types of employment, the p-value of 0.078 indicates that the difference was not statistically significant. Similarly, regarding husbands' income, the majority of respondents were in the 1–2 million rupiah per month income category, namely 42.5% (intervention) and 60% (control), with p = 0.079. Regarding maternal occupation, the majority were housewives (housewives), namely 80% in the intervention group and 72.5% in the control group. Meanwhile, regarding maternal income, the majority earned less than 1 million rupiah (intervention 80%; control 82.5%), with p = 0.659, indicating no significant difference between the two groups.

In terms of age, the average age of husbands in the intervention group was 27–55 years with a standard deviation of 4.088, while in the control group it was 22–40 years with a mean age of 27.30 years (SD 3.969). For maternal age, the intervention group ranged from 28-33 years (SD 5.308), and the control group 20-43 years with a mean of 28.15 years (SD 5.260). These data indicate that respondents in both groups were of productive age and the ideal age for childcare and participation in educational programs. Overall, the equality of these baseline characteristics provides a strong foundation for analyzing the effectiveness of the intervention, as it minimizes the possibility of bias originating from differences in respondent backgrounds. This also strengthens the internal validity of the study of culture-based peer educator interventions in enhancing the role of husbands in supporting exclusive breastfeeding.

Module development and quantitative implementation. The five-unit module was judged feasible by the cultural expert (85%) and the two medical experts (84.8% each). The 10-person small-group trial showed favorable ratings for ease of use (mean 3.20), usefulness (3.31), trust (3.20), and intention to use (3.33). Ten husband peer educators were then trained before the intervention was implemented among 80 husbands, with 40 participants in each group.

Table 3. Within-group pretest-posttest comparison of husbands' behavior and support with effect sizes

Outcome	Intervention pre	Intervention post	Test	p	Effect size	Control pre	Control post	Test	p	Effect size
Knowledge	8.13±1.604	12.95±1.108	Z=-5.461	<0.001	r=0.863	7.70±1.814	9.68±1.831	Z=-1.890	0.059	r=0.299
Attitude	34.33±4.599	44.43±3.104	t=-13.285	<0.001	dz=2.101	32.65±5.021	36.83±4.776	Z=-1.677	0.094	r=0.265
Action	28.93±3.316	42.13±3.406	t=-5.516	<0.001	dz=0.872	30.50±4.956	32.70±4.751	Z=-1.857	0.063	r=0.294
Emotional support	2.05±0.597	3.50±0.599	Z=-5.271	<0.001	r=0.833	1.83±0.747	2.48±0.640	Z=-1.719	0.086	r=0.272
Physical support	2.88±0.966	4.40±0.841	Z=-4.922	<0.001	r=0.778	2.50±0.877	3.10±0.871	Z=-0.535	0.593	r=0.085
Informational support	2.63±1.148	4.20±0.758	Z=-5.249	<0.001	r=0.830	2.18±0.984	2.58±0.931	Z=-0.832	0.405	r=0.132
Appraisal support	2.35±1.145	4.10±0.672	Z=-5.391	<0.001	r=0.852	2.48±1.012	2.60±0.982	Z=-1.633	0.102	r=0.258

Table 3 presents the within-group pretest-posttest results with effect sizes. In the intervention group, knowledge and the four support domains were analyzed with the Wilcoxon signed-rank test, while attitude and action were analyzed with paired-samples t-tests. All seven outcomes improved significantly (all p<0.001). The corresponding within-group effects were large: r=0.778–0.863 for the Wilcoxon outcomes and dz=0.872–2.101 for the paired t-test outcomes. In the control group, no statistically significant pretest-posttest changes were observed, and the effect sizes were small to moderate (r=0.085–0.299). Because

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paired difference SDs were not reported, 95% CIs for within-person mean changes could not be reconstructed without access to participant-level data. Shapiro-Wilk statistics and p-values were also not retained in the manuscript and should be added from the original statistical output as supplementary material.

Table 4. Monthly exclusive-breastfeeding checklist score at baseline and month 6

Assessment	Intervention mean	Intervention SD	Control mean	Control SD	p-value	Descriptive SMD (Cohen's d)
Baseline	1.55	0.597	1.64	0.533	0.352	-0.159
Month 6 (monthly status)	3.00	0.000	2.63	0.586	<0.001	0.893

Table 4 reports the monthly checklist score, which represents the infant's exclusive-breastfeeding status during the specific assessment month and should not be interpreted as uninterrupted maintenance over the preceding six months. At baseline, there was no statistically significant difference between groups (mean 1.55, SD 0.597 vs. 1.64, SD 0.533; p=0.352; descriptive Cohen's d=-0.159). At month six, all 40 intervention participants had a checklist score of 3 (mean 3.00, SD 0.000), while the control-group mean was 2.63 (SD 0.586; p<0.001; descriptive Cohen's d=0.893). The SD of 0.000 therefore indicates that all intervention participants met the checklist criteria at the month-six assessment; it does not mean that all 40 maintained exclusive breastfeeding continuously from birth through month six. Continuous maintenance was a separate longitudinal outcome derived from all six monthly observations.

Table 5. Sustained exclusive breastfeeding from birth through six months (primary outcome)

Outcome	Intervention n/N (%)	Control n/N (%)	Risk difference (95% CI)	Risk ratio (95% CI)	Odds ratio (95% CI)	p-value
Sustained exclusive breastfeeding through month 6	32/40 (80.0%)	15/40 (37.5%)	42.5% (23.0–62.0%)	2.13 (1.39–3.28)	6.67 (2.44–18.21)	<0.001

Thematic analysis generated one overarching theme, “Dalihan Na Tolu as a culturally embedded framework for strengthening husbands’ support for exclusive breastfeeding,” with three subthemes: (1) kinship-based roles and mutual obligations; (2) cultural traditions as channels for health education and social support; and (3) cultural norms that facilitate or inhibit husbands’ involvement in breastfeeding. These themes were developed through an iterative process of transcription, coding, categorization, comparison of codes, and identification of recurrent patterns across participants. Data collection continued until no new codes or concepts emerged from subsequent interviews, indicating data saturation.

The interpretation was validated through source triangulation by comparing accounts from the three husbands with those of three traditional leaders, two religious leaders, and two community leaders. Convergence of information across these participant groups strengthened the credibility of the identified themes. Participants were also given the opportunity to confirm the accuracy of the interpreted accounts through member checking.

Subtheme 1. Kinship-based roles and mutual obligations

The first subtheme concerned kinship-based roles and mutual obligations embedded in Dalihan Na Tolu. Participants described the three kinship positions—mora, kahanggi, and anak boru—as establishing reciprocal responsibilities, respect, and mutual assistance within the family and community. These values

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provided a culturally acceptable basis for encouraging husbands to become more actively involved in supporting breastfeeding mothers.

Subtheme 2. Cultural traditions as channels for health education and social support

The second subtheme concerned the use of culturally recognized traditions as channels for health education and social support. Participants identified mangupa, makkobar, and paroppa as culturally meaningful practices through which advice, prayers, encouragement, and social expectations could be conveyed. Integrating breastfeeding messages into these trusted cultural contexts was perceived as potentially increasing acceptance of health education among families and the wider community.

Subtheme 3. Cultural norms that facilitate or inhibit husbands' involvement

The third subtheme reflected both supportive and inhibiting cultural norms. Mora and kahanggi were perceived as important sources of advice, attention, prayer, and ceremonial support, whereas anak boru was associated with practical assistance in family and household activities. At the same time, traditional expectations regarding breastfeeding and the involvement of fathers in childcare could limit husbands' participation. Participants also described stigma toward husbands who were perceived as performing domestic work that was traditionally associated with women. These findings indicated that the intervention needed to strengthen supportive cultural values while addressing norms that could discourage husbands' involvement in breastfeeding.

Table 6. Development of themes and subthemes from qualitative data

Initial codes	Categories	Subthemes	Overarching theme	Initial codes
Mutual assistance; respect; family obligations; kinship responsibility	Kinship-based responsibilities	Kinship-based roles and mutual obligations	Dalihan Na Tolu as a culturally embedded framework for strengthening husbands' support for exclusive breastfeeding	Mutual assistance; respect; family obligations; kinship responsibility
Mangupa; makkobar; paroppa; advice; prayers; encouragement	Cultural communication and social support	Cultural traditions as channels for health education and social support		Mangupa; makkobar; paroppa; advice; prayers; encouragement
Practical assistance; household support; childcare	Forms of family and husband support	Cultural traditions as channels for health education and social support		Practical assistance; household support; childcare

Across the three subthemes, participants described Dalihan Na Tolu as a framework of reciprocal responsibility, mangupa, makkobar, and paroppa as culturally meaningful channels for advice and social support, and gendered expectations as both facilitators and barriers to husbands' practical involvement. These findings informed the intervention strategy by strengthening culturally supportive values while addressing norms that could discourage husbands from participating in breastfeeding and household activities.

The convergence of these subthemes led to the overarching theme, "Dalihan Na Tolu as a culturally embedded framework for strengthening husbands' support for exclusive breastfeeding." The theme reflects the central finding that cultural values and kinship structures can be mobilized to strengthen husbands' involvement while addressing cultural norms that may limit their participation.

The integration of quantitative and qualitative findings strengthens the interpretation of the intervention effect. Quantitatively, the intervention group had a higher month-six checklist status and a substantially higher proportion of mothers who maintained exclusive breastfeeding continuously through six months. Qualitatively, participants described cultural mechanisms through which husbands could be encouraged to provide emotional, physical, informational, and appraisal support. These findings are complementary: the

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quantitative results demonstrate the observed change, whereas the qualitative findings provide insight into how and why the intervention may have contributed to that change.

However, the qualitative findings also demonstrated that culture can function as both a facilitator and a barrier. The third subtheme, cultural norms that facilitate or inhibit husbands' involvement, showed that traditional expectations may support family cooperation while simultaneously limiting husbands' participation in activities perceived as women's responsibilities. In particular, stigma toward husbands who perform domestic tasks may discourage active involvement in breastfeeding and infant care.

This finding is important because it demonstrates that a culturally based intervention should not simply preserve all existing cultural practices. Instead, it should identify cultural values that can be mobilized to support healthy behaviors while critically addressing norms that may inhibit participation. In this study, values of mutual assistance, kinship responsibility, respect, and collective support were strengthened, while restrictive expectations regarding gendered household roles were addressed through the peer education process.

Husbands' support is a modifiable determinant of exclusive breastfeeding. Early, practical education can strengthen husbands' knowledge, motivation, and confidence to provide emotional reassurance, household assistance, useful information, and positive appraisal. The primary sustained outcome was 80.0% in the intervention group versus 37.5% in the control group, corresponding to a risk ratio of 2.13 (95% CI 1.39–3.28), risk difference of 42.5 percentage points (95% CI 23.0–62.0), and odds ratio of 6.67 (95% CI 2.44–18.21). These estimates indicate a substantial association, but the quasi-experimental design and absence of cluster adjustment preclude a definitive causal interpretation.

The findings indicate that husbands' involvement in breastfeeding in the Angkola Batak community was constrained by patriarchal norms, despite the importance of husbands' knowledge, practical skills, and support. The culture-based module addressed these constraints by using trusted male peers and culturally legitimate forms of communication. The term 'peer' refers to people of comparable social status; discussions among fathers may be more open and culturally relevant than conventional teacher-led education (24). The module's expert feasibility scores of 85% and 84.8%, together with favorable small-group ratings, support its content validity and acceptability. Its five learning units integrated practical breastfeeding skills, the Angkola Batak language, and local traditions and values, enabling peer educators to deliver information in a form familiar to participating husbands.

Overall, the findings indicate that the Angkola Batak culture-based peer educator intervention was associated with stronger husbands' support and higher sustained exclusive breastfeeding. However, because of non-random allocation, self-reported outcomes, unadjusted clustering, incomplete reliability evidence for several instruments, and the absence of a longitudinal mixed-effects analysis, the findings should be interpreted as evidence of an association rather than definitive proof of causality. Further studies with individual-level randomization or adequately adjusted cluster designs, validated instruments, blinded outcome assessment where feasible, and repeated-measures models are needed (27).

Study limitations. Several limitations should be considered. First, the quasi-experimental allocation was non-random, and the current manuscript lacks a complete baseline characteristics table for the quantitative sample; residual selection and confounding bias therefore cannot be excluded. Second, the husband-support, attitude, and action instruments were researcher-developed, but reliability coefficients were only reported for the knowledge questionnaire (Cronbach's alpha 0.739). Third, exclusive breastfeeding was based on maternal self-report, while husband behavior and support were also self-reported or partner-reported, creating potential recall and social-desirability bias. Participants and outcome assessors were not blinded, and the additional attention received by intervention participants may have introduced a Hawthorne effect. Fourth, the 10 peer educators created clustering among intervention

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participants, but the analysis did not estimate an intraclass correlation or use a multilevel model. Fifth, although breastfeeding was monitored monthly, the analysis did not model all six repeated observations using GEE or mixed-effects methods. Finally, multiple hypothesis tests were performed without a prespecified multiplicity correction in the original analysis; Holm-adjusted sensitivity interpretation did not alter the qualitative conclusion for the intervention-group tests, but the possibility of Type I error inflation remains (28).

The qualitative phase also has important limitations. Only three husbands were primary participants, while seven additional informants were traditional, religious, or community leaders. Thus, the qualitative themes should not be interpreted as representing husbands' experiences solely from direct husband narratives; seven of ten informants contributed indirect or contextual perspectives. The rationale for selecting these seven key informants was role-based purposive sampling rather than a formal sampling calculation, and the manuscript does not provide a detailed sampling matrix. In addition, module validation involved only three experts, and the reported 85% and 84.8% feasibility scores were not calculated using a named index in the available materials. Finally, intervention fidelity was not formally assessed, so variation in how peer educators delivered the sessions cannot be excluded (29).

The main contribution of this study lies in the integration of culture-based peer education with a husband-focused breastfeeding intervention. Rather than positioning fathers only as recipients of breastfeeding information, the intervention recognized husbands as active supporters whose behaviors are embedded within a wider kinship structure. The incorporation of Dalihan Na Tolu and culturally meaningful practices such as mangupa, makkobar, and paroppa provided a locally relevant framework for translating breastfeeding recommendations into culturally acceptable actions (25).

The findings suggest that this culturally responsive approach may strengthen husbands' involvement and may be associated with improved maintenance of exclusive breastfeeding. The observed effect should nevertheless be interpreted cautiously because the study was quasi-experimental and had measurement and clustering limitations. Future studies should verify the findings in larger, multisite samples using validated instruments and longitudinal multilevel methods (30).

Overall, the findings indicate that the Angkola Batak culture-based peer educator intervention has potential to strengthen exclusive breastfeeding by increasing the social and cultural support available to breastfeeding mothers. The significant improvement in exclusive-breastfeeding outcomes at six months, together with qualitative evidence concerning kinship responsibilities, cultural communication, and supportive social norms, suggests that culturally responsive interventions can provide a meaningful pathway for strengthening husbands' involvement in breastfeeding. Nevertheless, the findings should be interpreted in light of the study design and sample size, and further studies involving larger samples and multiple settings are needed to determine the generalizability and long-term effectiveness of the intervention.

CONCLUSION

The main contribution of this study lies in the integration of culture-based peer education with a husband-focused breastfeeding intervention. Rather than positioning fathers only as recipients of breastfeeding information, the intervention recognized husbands as active supporters whose behaviors are embedded within a wider kinship structure. The incorporation of *Dalihan Na Tolu* and culturally meaningful practices such as *mangupa*, *makkobar*, and *paroppa* provided a locally relevant framework for translating breastfeeding recommendations into culturally acceptable actions.

This approach may be particularly valuable in communities where family and kinship relationships remain important determinants of health-related decision-making. The findings therefore suggest that

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breastfeeding interventions may benefit from moving beyond individual-level education toward approaches that integrate gender roles, family relationships, cultural values, and community social support.

AUTHOR CONTRIBUTIONS

The first author conceived the study, designed the methodology, collected and analyzed the data, and drafted the manuscript. The second author contributed to the study design, oversaw the study, interpreted the findings, and critically revised the manuscript. The third author contributed to data validation, interpretation of results, review and editing the manuscript, overall supervision, and approved the final version of the manuscript. All authors read and approved the final version of the manuscript.

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