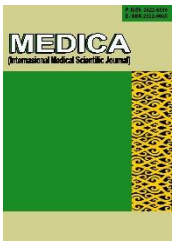
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An Atoin Amaf Social Capital Model for Integrated Prenatal Care and Stunting Prevention

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Abstract

Stunting remains a major public health concern in East Nusa Tenggara (NTT), particularly in Timor Tengah Selatan (TTS) District. This study aimed to explore prenatal care practices among Timor Dawan women, examine the role of family and Atoin Amaf in supporting pregnant women, and evaluate initial changes in knowledge, attitude, and behavior regarding prenatal care after a health promotion intervention. A sequential exploratory mixed-methods design was employed. The qualitative phase involved 12 informants, and the data were analyzed thematically. The quantitative phase consisted of a single-group pretest–posttest pilot evaluation involving 30 pregnant women without a control group. The two-day intervention was conducted in collaboration with a midwifery coordinator, with Atoin Amaf accompanying pregnant women during nutritional assessments. The qualitative findings indicated increased acceptance of maternal health services, changes in food-related beliefs following health education, and inconsistent family support. Knowledge scores increased from 38.83 ± 13.31 to 84.50 ± 7.23, with a mean difference of 45.67 (95% CI: 40.21–51.12; $t(29) = 17.125$; $p < 0.001$; $dz = 3.13$). Attitude scores increased from a median of 80.00 to 93.00 ($Z = -4.791$; $p < 0.001$; $r = 0.875$), while behavior scores increased from 57.87 ± 15.21 to 89.70 ± 4.86, with a mean difference of 31.83 (95% CI: 26.08–37.59; $t(29) = 11.318$; $p < 0.001$; $dz = 2.07$). These preliminary findings indicate improvements in knowledge, attitudes, and behaviors following the intervention. However, the findings do not establish a causal relationship or demonstrate a reduction in stunting, as the study did not include a control group or measurements of child growth.

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1. INTRODUCTION

The 2024 Indonesian Nutritional Status Survey reported that the national stunting prevalence decreased from 21.5% in 2023 to 19.8% in 2024. However, the absolute burden remains significant, and East Nusa Tenggara (NTT) continues to have a high stunting burden (Kementerian Kesehatan Republik Indonesia, 2025). Stunting is defined as a height-for-age z-score more than two standard deviations below the median of the WHO Child Growth Standards among children under five years of age (World Health Organization, 2024). Provincial-level data are used to provide epidemiological context rather than as the primary outcome of the study (Pemerintah Provinsi Nusa Tenggara Timur, 2023; Tim Percepatan Penurunan Stunting Provinsi Nusa Tenggara Timur, 2023).

Maternal nutrition, access to antenatal care, health-service utilization, and family or community support are important components of stunting prevention (United Nations Children's Fund, 2021). This operational study focused on pregnancy-care practices and on strengthening the social role of family members, Atoin Amaf, community leaders, religious leaders, and health workers in supporting pregnant women in Timor Dawan community.

In the Timor Dawan community, an Atoin Amaf refers to a male figure in the extended family, such as a husband, father, or uncle, who can influence decision-making, provide accompaniment, allocate food and financial resources, and facilitate access to healthcare services. Social capital is understood through kinship networks, trust, norms of reciprocity, as well as informational, emotional, and instrumental support.

Existing evidence suggests that family and community engagement can support maternal and child health, particularly by improving antenatal care utilization (Tokhi et al., 2018; Suandi et al., 2020). From a social capital perspective, social networks, trust, and norms of reciprocity facilitate information exchange, resource mobilization, and collective action (Coleman, 1988; Putnam, 2000). In stunting prevention, social capital and family dynamics may contribute to improved nutritional practices and child health (Prayitno et al., 2025; Rahmadiyah et al., 2024). However, the integration of culturally embedded authority, particularly the role of Atoin Amaf, into integrated prenatal care remains insufficiently explored.

Even though studies on social capital and family-based interventions have increased, evidence remains limited on the systematic integration of Atoin Amaf's cultural authority into the prenatal care intervention component within the Timor Dawan community. Therefore, this current study aims to address the reported gap. Among children under 2 years of working mothers, the adjusted odds of stunting were higher for children aged 12–23 months than for those aged <12 months (AOR 2.831, 95% CI 2.809–2.854) and for children in the poorest compared with the richest wealth group (AOR 2.751, 95% CI 2.715–2.787; both $p<0.001$) (Supadmi et al., 2024).

Across surveys from 36 low- and middle-income countries, facility-based antenatal care had a median slope index of inequality (SII) of 26.7 (range 17.0–47.2) and concentration index (CIX) of 10.0 (4.2–17.1). Meanwhile, community-delivered oral rehydration therapy had a median SII of 9.4 (2.9–19.0) and CIX of 3.4 (1.3–25.0). Differences among delivery-channel groups were significant for SII ($p=0.0052$) and CIX ($p=0.0048$) (Leventhal et al., 2021). An Indonesian qualitative study with 60 purposively selected informants identified social networks, collective norms, and trust as components of social capital supporting collaborative stunting reduction. This qualitative study did not report an effect size or an outcome percentage (Astuti et al., 2025). In Alor District, a seven-session family-based intervention including 60 mothers (30 per group) produced significant group-by-time effects on knowledge ($F=16.50$), attitude ($F=33.91$), and self-efficacy ($F=27.92$), all $p<0.001$ (Setiawan et al., 2026). This study aimed to explore

prenatal care practices among Timor Dawan women, examine the role of family and Atoin Amaf in supporting pregnant women, and evaluate initial changes in knowledge, attitude, and behavior regarding prenatal care after a health promotion intervention.

2. METHODS

This study used a mixed-methods exploratory sequential design. The qualitative phase used an exploratory approach with thematic analysis to identify prenatal care practices, nutrition beliefs, use of maternal health services, as well as support from family members and the Atoin Amaf. These results were used to develop the content and implementation of health promotion interventions in the subsequent phase. The quantitative phase adopted a quasi-experimental one-group pretest-posttest design without a control group. The quantitative component was framed as a pilot evaluation because of the small sample size and the lack of a control group. This study was conducted in Niki-Niki Community Health Center area in TTS District, after reporting 189 stunted children (36.5%).

The quantitative component comprised 30 pregnant women in the second trimester or later. The qualitative phase comprised 12 informants, namely four Atoin Amaf (heads of households), two community health volunteers, two healthcare workers, one coordinating midwife, two pregnant women, and one member of the family welfare empowerment movement (PKK). Qualitative informants were recruited using purposive and snowball sampling.

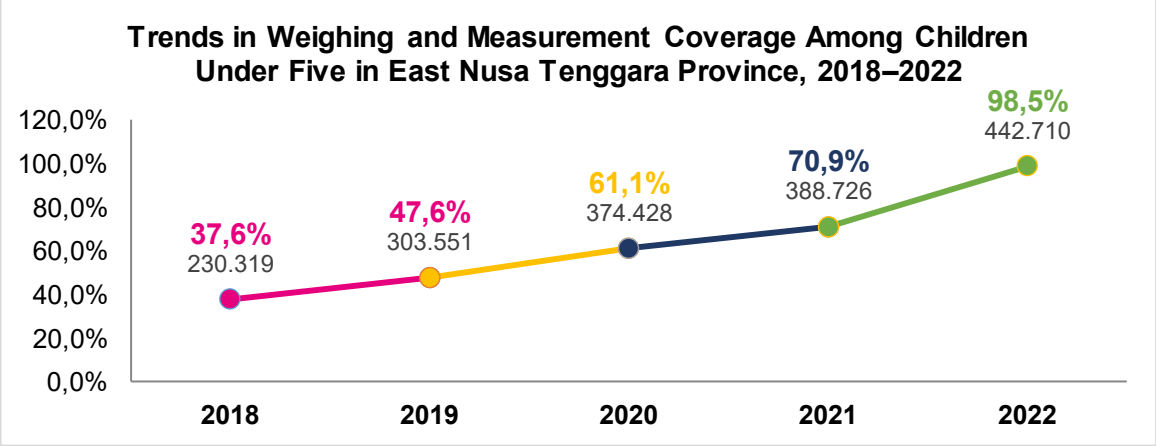
Qualitative data were collected through a review of program documents, individual in-depth interviews, one focus group discussion (FGD), and field observations. The interview and discussion guide covered the utilization of antenatal care services, pregnancy nutrition and food-related beliefs, family support, as well as the roles of community actors and health sector. Meanwhile, quantitative data were collected using a pretest-posttest questionnaire on stunting prevention. The instrument comprised three domains, namely knowledge of stunting prevention (20 items), attitude toward stunting prevention (11 items), and stunting prevention actions (18 items). Before the main study, the instrument was piloted on 30 pregnant women from another community health center with similar population characteristics. Content validity was assessed by three experts in health promotion, midwifery, and community nutrition. In addition, item validity was analyzed using corrected item-total correlation with an acceptable limit of ≥0.30. The ranges of item correlation and Cronbach's alpha were 0.322–0.811 and 0.933 for knowledge, 0.401–0.858 and 0.811 for attitude, and 0.362–0.785 and 0.898 for actions, respectively. The items met the validity threshold, and all three domains reported good internal consistency. Participant characteristics included age, education, occupation, parity, weight, height, mid-upper arm circumference, and hemoglobin.

Qualitative results were mapped to intervention needs, and food-related beliefs were addressed through maternal nutrition education. Time constraints faced by those providing support were addressed by clarifying family roles, and the need for decision-making support was addressed by including key male family figures. The intervention spanned two days and used leaflets, the Maternal and Child Health (MCH) handbook, and presentations. This was delivered in collaboration with the coordinating midwife. Atoin Amaf were included by accompanying pregnant women during nutritional assessments throughout their pregnancy.

Data analysis and integration were conducted using mixed methods. Qualitative results were grouped into themes of maternal health service utilization, food-related beliefs and practices, and family support. Normality was assessed based on the distribution of

post-test minus pre-test differences. A paired t-test was used for knowledge and behavior, while the Wilcoxon signed-rank test was used for attitude. Effect sizes were reported as Cohen's dz for the t-test and r=|Z|/√N for the Wilcoxon test. Correlation coefficients of r = 0.6570 and r = 0.9068 were not used as evidence of effectiveness. Integration was achieved by using qualitative themes to determine the content focus, the actors, the media, and the forms of support provided during the intervention. This study received ethical approval from the Ethics Committee of the Kupang Health Polytechnic of the Ministry of Health (reference number LB.02.03/1/0090/2026), and all informants provided informed consent before data collection.

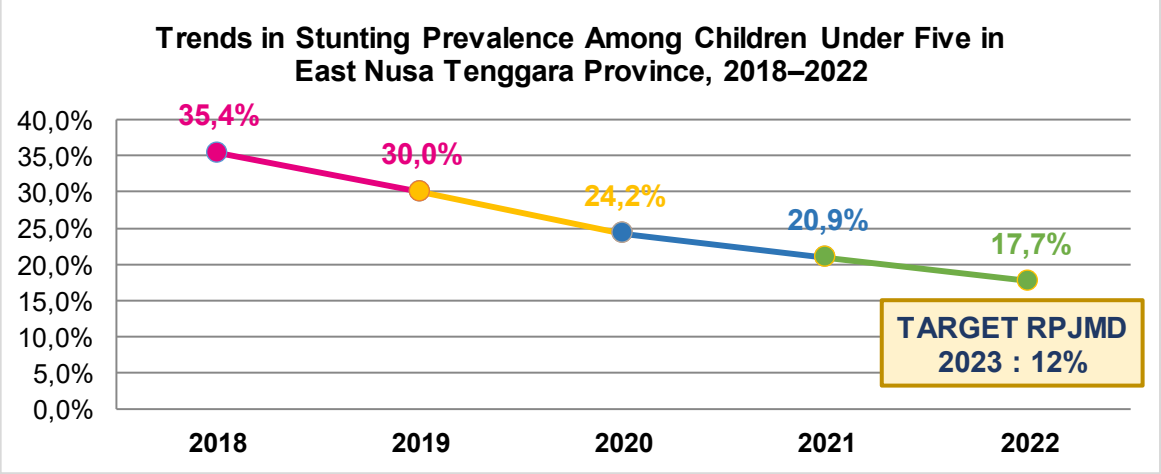
3. RESULTS AND DISCUSSION



Source: *Adapted by the authors from e-PPGBM data presented by NTT Provincial Stunting Reduction Acceleration Team* (Tim Percepatan Penurunan Stunting Provinsi Nusa Tenggara Timur, 2023).

Figure 1. Trends in stunting percentage achievement in NTT Province, 2018–2022.

Figure 1 shows a downward trend in stunting prevalence between 2018 and 2022. The source presentation reports an average annual decline of 4.4 percentage points.



Source*: Adapted by the authors from e-PPGBM data presented by NTT Provincial Stunting Reduction Acceleration Team* (Tim Percepatan Penurunan Stunting Provinsi Nusa Tenggara Timur, 2023).

Figure 2. Trend in the Number of Toddlers Weighed and Measured in NTT Province, 2018–2022.

Figure 2 shows an upward trend in the number of children under five weighed and measured in NTT Province during 2018–2022.

Table 1. Achievements of implementing toddler weighing operations by district/city in 2021–2022.

COVERAGE OF CHILDREN UNDER FIVE WEIGHED BY REGENCY/CITY IN EAST NUSA TENGGARA PROVINCE, 2021–2022

No	Regency/City	Actual Number of Children Under Five Targeted for Monitoring (S), August	Number of Children Under Five Weighed (D), August 2022	Actual D/S Coverage (Children Under Five Weighed/Measured), August 2022	STUNTING AMONG CHILDREN UNDER FIVE YEARS OF AGE									
					Number of Stunted Children Under Five, August 2021	Number of Stunted Children Under Five, August 2022	Stunting Prevalence (%), August 2022	Stunting Prevalence (%), August 2021	Trend (August 2021–August 2022)	Number of Stunted Children Under Five, August 2022	Number of Stunted Children Under Five, February 2022	Stunting Prevalence (%), August 2022	Stunting Prevalence (%), February 2022	Trend (February–August 2022)
1	WEST SUMBA REGENCY	11.194	11.194	100,0	2.611	2.079	23,3	23,6	Decreasing (↓)	2.611	2.306	23,3	22,7	Increasing (↑)
2	EAST SUMBA REGENCY	23.324	23.324	100,0	3.478	3.774	14,9	19,1	Decreasing (↓)	3.478	4.696	14,9	20,9	Decreasing (↓)
3	KUPANG REGENCY	30.772	30.772	100,0	6.118	6.674	19,9	22,3	Decreasing (↓)	6.118	7.207	19,9	24,1	Decreasing (↓)
4	SOUTH CENTRAL TIMOR REG	41.137	41.137	100,0	11.642	13.123	28,3	32,1	Decreasing (↓)	11.642	12.439	28,3	29,8	Decreasing (↓)
5	NORTH CENTRAL TIMOR REG	21.632	21.632	100,0	5.280	5.204	24,4	25,3	Decreasing (↓)	5.280	6.428	24,4	31,6	Decreasing (↓)
6	BELU REGENCY	18.101	18.101	100,0	2.473	3.171	13,7	17,9	Decreasing (↓)	2.473	2.920	13,7	16,2	Decreasing (↓)
7	ALOR REGENCY	18.363	18.153	98,9	2.119	3.149	11,7	19,0	Decreasing (↓)	2.119	2.555	11,7	15,6	Decreasing (↓)
8	LEMBATA REGENCY	9.408	8.716	92,6	1.398	1.804	16,0	22,2	Decreasing (↓)	1.398	1.895	16,0	22,7	Decreasing (↓)
9	EAST FLORES REGENCY	18.374	18.229	99,2	3.412	3.696	18,7	20,9	Decreasing (↓)	3.412	3.636	18,7	20,4	Decreasing (↓)
10	SIKKA REGENCY	23.874	23.062	96,6	3.174	3.947	13,8	18,2	Decreasing (↓)	3.174	3.984	13,8	17,2	Decreasing (↓)
11	ENDE REGENCY	19.586	19.586	100,0	1.749	2.775	8,9	14,3	Decreasing (↓)	1.749	2.484	8,9	12,7	Decreasing (↓)

Source: ePPGBM data from 22 regencies/cities; data cut-off: September 26, 2022, at 4:00 PM Central Indonesia Time (WITA)

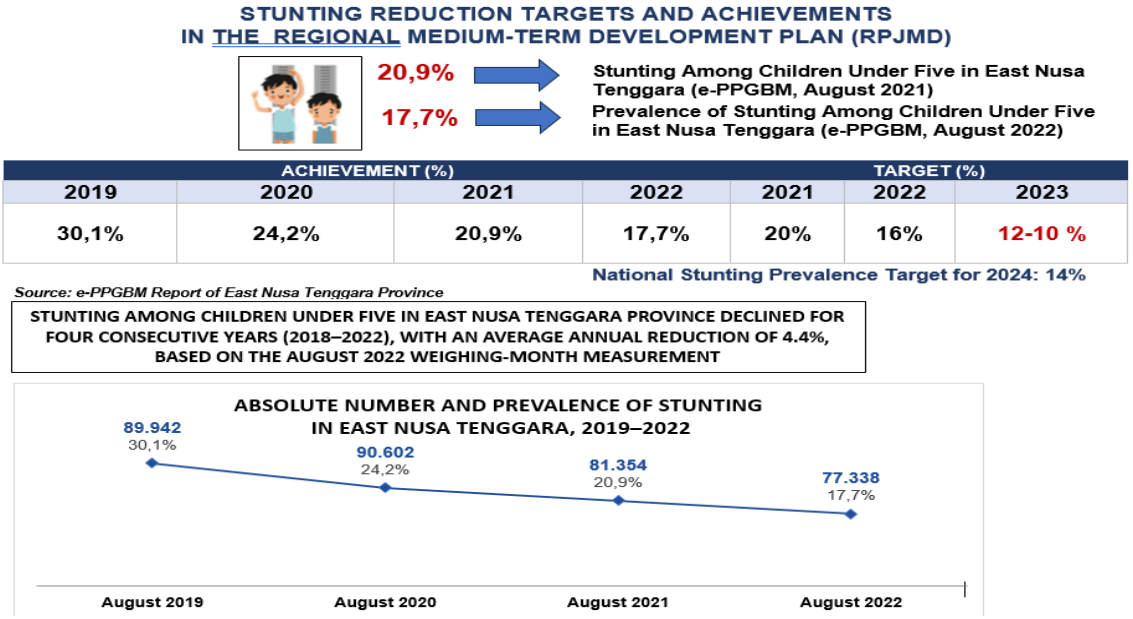
COVERAGE OF CHILDREN UNDER FIVE WEIGHED BY REGENCY/CITY IN EAST NUSA TENGGARA PROVINCE, 2021–2022

No	Regency/City	Actual Number of Children Under Five Targeted for Monitoring (S), August	Number of Children Under Five Weighed (D), August 2022 Ags 2022	Actual D/S Coverage (Children Under Five Weighed/Measured), August 2022	STUNTING AMONG CHILDREN UNDER FIVE YEARS OF AGE									
					Number of Stunted Children Under Five, August 2022	Number of Stunted Children Under Five, August 2021	Stunting Prevalence (%), August 2022 AGS 2022	Stunting Prevalence (%), August 2021 AGS 2021	Trend (August 2021–August 2022) AGS 2022	Number of Stunted Children Under Five, August 2022	Number of Stunted Children Under Five, February 2022	Stunting Prevalence (%), August 2022	Stunting Prevalence (%), February 2022	Trend (February–August 2022)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12	NGADA REGENCY	11039	11039	100,0	1027	1222	9,3	11,7	Decreasing (↓)	1027	1159	9,3	10,6	Decreasing (↓)
13	MANGGARAI REGENCY	28024	26563	94,8	4313	4841	16,2	18,9	Decreasing (↓)	4313	5320	16,2	20,1	Decreasing (↓)
14	ROTE NDAO REGENCY	13665	13523	99,0	3011	3103	22,3	23,5	Decreasing (↓)	3011	3513	22,3	26,1	Decreasing (↓)
15	WEST MANGGARAI REGENCY	23118	23118	100,0	3675	3495	15,9	15,1	Increasing (↑)	3675	3769	15,9	16,2	Decreasing (↓)
16	CENTRAL SUMBA REGENCY	7562	7562	100,0	659	559	8,7	8,1	Increasing (↑)	659	671	8,7	8,8	Decreasing (↓)
17	SOUTHWEST SUMBA REGENCY	34874	34056	97,7	8270	6360	24,3	31,2	Decreasing (↓)	8270	13150	24,3	44,3	Decreasing (↓)
18	NAGEKEO REGENCY	11245	11234	99,9	946	991	8,4	9,2	Decreasing (↓)	946	1180	8,4	10,4	Decreasing (↓)
19	EAST MANGGARAI REGENCY	25033	25009	99,9	2408	3052	9,6	13,7	Decreasing (↓)	2408	2767	9,6	11,6	Decreasing (↓)
20	SABU RAIJUA REGENCY	8287	8287	100,0	1496	2037	18,1	25,5	Decreasing (↓)	1496	2048	18,1	24,4	Decreasing (↓)
21	MALAKA REGENCY	16378	16289	99,5	2582	3230	15,9	21,5	Decreasing (↓)	2582	3076	15,9	18,9	Decreasing (↓)
22	KUPANG CITY	27720	25543	92,1	5497	3068	21,5	26,1	Decreasing (↓)	5497	3829	21,5	25,1	Decreasing (↓)
	TOTAL	206945	202223	98,5	33884	31958	17,7	20,9	Decreasing (↓)	33884	40482	17,7	22,0	Decreasing (↓)

Source: e-PPGBM data from 22 regencies/cities; data cut-off: September 26, 2022, at 16:00 WITA (Central Indonesia Time).

Source: *Adapted by the authors from e-PPGBM data presented by the NTT Provincial Stunting Reduction Acceleration Team (Tim Percepatan Penurunan Stunting Provinsi Nusa Tenggara Timur, 2023).*

Table 1 shows that D/S coverage ranges from 92.6% to 100%, with TTS District reaching 100%.



Source: *Adapted by the authors from e-PPGBM data presented by the NTT Provincial Stunting Reduction Acceleration Team (Tim Percepatan Penurunan Stunting Provinsi Nusa Tenggara Timur, 2023).*

Figure 3. Target and realization of stunting reduction in RPJMD of NTT, 2021–2023.

Figure 3 shows the target and realization of stunting reduction in NTT. The source presentation reports a decline through the August 2022 weighing period, with an average annual decrease of 4.4 percentage points. Participants described changes in prenatal care and maternal health service utilization following reforms. This includes increased acceptance of antenatal care and facility-based deliveries. Interviews also explored beliefs about food and the availability of family support during antenatal visits.

Statements on service utilization and childbirth in healthcare facilities, presented in the following sections, reflect the perceptions of informants rather than population estimates or verified facility-level data.

> *"All pregnant women gave birth in adequate health facilities through the KIA revolution since 2015. These women voluntarily came for prenatal checkups and were willing to give birth there."* (IB)

Subsequently, Informant 4 added:

> "*In the past, many pregnant women were reluctant to give birth at the community health center, but now things have changed... all pregnant women receive prenatal checkups and are willing to give birth at the community health center. Since 2008, no maternal deaths have been recorded among pregnant, laboring, or postpartum women in Niki-Niki Community Health Center service area, either at home or at health center*." (IN)

The claim that there have been no maternal deaths since 2008 is based on a report from an informant and has not been verified through official healthcare facility records.

Concerning the services provided during pregnancy, childbirth, and infant care, Informant 2 stated:

> *"In the past, pregnant women were afraid to eat fish or consume adequate amounts of food. However, after obtaining health education from the community health center midwives, mothers are no longer anxious about eating fish and meat because they contain protein, which is important for children's brain growth and development, making them intelligent." (IP)*

In-depth interviews showed that some pregnant, laboring, and postpartum women are not accompanied by husbands when visiting the community health center. A pregnant woman explained that her husband is willing to drive her but often wants to go home quickly to continue work, limiting the time available for counseling from health care providers.

> *"The husbands are also supportive because they are willing to accompany their wives to the community health center. However, they tend to be somewhat impatient and want to return home quickly to attend to other work. As a result, there is inadequate time for the wives to receive health education or counseling from health care providers."* (IP)

Pregnant women need to be accompanied by family or friends who can make time to ensure complete services are received during ANC. Observations during implementation showed that some women came accompanied by the husbands or family. Husbands who consistently accompanied the wives during checkups and health promotion were those expecting first child. Informant 5 stated that:

> *"It was very difficult for us to have a child. This is our first child, whom we had been eagerly waiting for."* (BA)

Husbands and Atoin Amaf made time to accompany pregnant women to antenatal checkups and participate in health promotion programs on pregnancy. This observed role supports the positioning of family members as active partners in antenatal care and nutrition counseling. Health workers can provide structured promotion on pregnancy care, nutrition, and family support through pregnancy classes or Prenatal Care and Family classes.

The experts and the coordinating midwife provided educational materials, while the Atoin Amaf assisted pregnant women during nutritional assessments. These qualitative results were translated into components covering nutritional education, family support, decision-making assistance, and preparation for the utilization of maternal health services.

The quantitative component comprised 30 pregnant women. Paired t-test results showed a statistically significant difference in knowledge of pregnancy care between the pretest and posttest ($p=0.0001$). The reported correlations were $r=0.6570$ between pretest I and posttest I as well as $r=0.9068$ between pretest II and posttest II.

Table 2. Changes in knowledge, attitude, and behavior scores after the intervention.

Outcomes	Pretest → posttest	Key changes and tests
Knowledge	38.83±13.31 → 84.50±7.23	Δ=45.67; 95% CI 40.21–51.12; t(29)=17.125; p<0.001; dz=3.13

Outcomes	Pretest → posttest	Key changes and tests
Attitude	Median 80.00 → 93.00	Δ median=15.00; IQR 13.00–19.50; Z=-4.791; p<0.001; r=0.875
Behavior	57.87±15.21 → 89.70±4.86	Δ=31.83; 95% CI 26.08–37.59; t(29)=11.318; p<0.001; dz=2.07

Table 3 shows that all 30 participants completed the pretest and posttest. Knowledge scores increased from 38.83 ± 13.31 to 84.50 ± 7.23 (mean difference 45.67; 95% CI 40.21–51.12; t(29)=17.125; p<0.001; dz=3.13). Attitude scores increased from a median of 80.00 to 93.00 (median change 15.00; IQR 13.00–19.50; Z=-4.791; p<0.001; r=0.875). Behavior scores increased from 57.87 ± 15.21 to 89.70 ± 4.86 (mean difference 31.83; 95% CI 26.08–37.59; t(29)=11.318; p<0.001; dz=2.07). These results show changes in proximal outcomes after the intervention, but not evidence of a causal effect or prevention of stunting.

This study reported two important results. First, family support matters but is not always consistent since work commitments and time constraints can limit mothers' opportunity to receive comprehensive counseling. Second, the pilot evaluation showed improvements in knowledge, attitude, and behavior scores after the intervention. These results support the preliminary feasibility of the educational materials but do not establish a causal effect or an impact on stunting.

A qualitative systematic review reports that male participation in antenatal care is influenced by knowledge, gender norms, couple communication, access to services, and the attitude of health workers (Chiang & Shorey, 2023). In this study, men's willingness to accompany partners shows a distinction between physical presence and the engagement required for comprehensive counseling. The Atoin Amaf is positioned as a contextual mechanism to strengthen family support for information, decision-making, and resources. However, this mechanism has not yet been tested directly.

Nutrition counseling in this model needs to be locally specific. Dietary data from 10 high-stunting districts in Indonesia showed that the number of problematic nutrients ranged from 1 to 6 and 0 to 7 among pregnant women and children under 5, respectively. Iron, folate, and calcium were the three leading nutrients for pregnant women (Fahmida et al., 2022).

The emphasis on repeated health promotion is supported by an Indonesian randomized controlled trial comprising 80 mother-child dyads (40 per group). A four-week nutrition-education program increased maternal undernutrition knowledge (β=4.77) and complementary feeding behavior (β=5.70) as well as improved mean height-for-age/stunting z-scores at 12 weeks (β=0.47) and 24 weeks (β=0.63), p<0.001 (Mardani et al., 2024).

In a cross-sectional study of 75 mothers in Kupang District, good maternal knowledge was reported among 45 mothers who practiced exclusive breastfeeding (77.59% within the exclusive-breastfeeding group), and maternal knowledge was associated with exclusive breastfeeding (p=0.003). Good family support was reported for 24 mothers who practiced exclusive breastfeeding (41.38% within the exclusive-breastfeeding group), and family support was also associated with exclusive breastfeeding (p=0.018) (Ratu Ludji, 2024).

WHO recommends the introduction of complementary foods at 6 months while continuing breastfeeding (World Health Organization, 2023). The proposed model is also conceptually balanced with Ratu Ludji's Social Ecological Model of Health Behavior. This applies intrapersonal, interpersonal, institutional, community, and policy-level determinants to pregnancy and postpartum care (Ratu Ludji, 2023).

Evidence on complementary feeding suggests that nutritional support can be designed without displacing breastfeeding or home foods. In a cluster-randomized trial of 5,499 children, 97% were breastfed at 18 months, and only 51% met minimum dietary diversity. Furthermore, breastfeeding frequency did not differ between supplementation groups. The odds of meeting the minimum dietary diversity from home foods were equal to or greater than the control group at all assessed ages (Campbell, et al, 2016).

Access to antenatal care must be considered within the community-based model. In an ecological analysis of 34 Indonesian provinces, health, nutrition, housing, and food dimensions explained 88.1% of the variation in initial antenatal care coverage. Nutrition, social protection, and food explained 58.6% of first-trimester coverage. Meanwhile, health, nutrition, and food coverage accounted for 67.2% of four visits (Silaen et al., 2025).

Social Cognitive Theory further explains how personal factors, behaviour, and environmental conditions may interact during the implementation of health recommendations (Bandura, 1986, 2004). Nutrition education may improve knowledge, while family encouragement and practical assistance may create opportunities to apply that knowledge. Within this process, maternal self-efficacy may influence whether women feel capable of attending antenatal visits, communicating their concerns, and adopting recommended nutritional practices (Bandura, 1997). However, self-efficacy was not directly measured in the present study and should be considered a potential explanatory mechanism rather than an established outcome.Stunting, maternal nutritional status, birth outcomes, and child growth were not measured. Therefore, the link to stunting prevention remains theoretical and requires validation through controlled, longitudinal studies.The magnitude of the changes in scores should be interpreted with caution since the post-test was conducted shortly after the educational sessions. The informants showed improvement, and the post-test scores were concentrated at the high end of the scale. Learning, testing, and ceiling effects played an important role.

In the context of stunting prevention, the Atoin Amaf Social Capital Model may offer a framework for integrating context-specific nutrition education with sustained family support from pregnancy through the postpartum period. Evidence of inadequate nutrient intake among pregnant women and children under five in Indonesian areas with high stunting prevalence underscores the importance of locally tailored nutritional counselling (Fahmida et al., 2022). Furthermore, nutrition-sensitive interventions should address the social and environmental determinants of maternal and child nutritional status (Ruel & Alderman, 2013). Relevant practices include early initiation of breastfeeding, rooming-in, exclusive breastfeeding from birth to six months, the introduction of complementary foods at six months, and continued breastfeeding up to two to three years of age (World Health Organization, 2023). However, because maternal nutritional status, birth outcomes, and child growth were not assessed, the model's contribution to stunting prevention cannot yet be established. The Atoin Amaf Social Capital Model offers a culturally grounded approach to stunting prevention by integrating maternal health education with family and community support. Social Capital Theory highlights the potential of trust, social networks, and shared norms to facilitate access to health information and antenatal care (Coleman, 1988; Mengesha et al., 2021), while the Health Belief Model explains how perceived benefits and barriers may influence preventive practices (Rosenstock, 1974; Janz & Becker, 1984). The qualitative findings suggest that Atoin Amaf could reinforce nutritional counselling and family engagement; however, occupational demands and limited time may constrain effective participation. Therefore, stunting prevention programmes should combine context-specific nutrition education with structured family involvement, practical support for antenatal care, and respect for maternal autonomy. As the present study did not measure stunting-related outcomes or directly assess the proposed theoretical

mechanisms, controlled longitudinal studies are needed to determine whether this model improves sustained preventive practices and maternal and child health outcomes.

The integration of quantitative and qualitative data strengthens the interpretation of the findings by linking changes in knowledge, attitudes, and practices to the family's social context. Nevertheless, the short follow-up period, potential testing and ceiling effects, and absence of a comparison group limit causal inference. Future research should employ controlled longitudinal designs to compare education alone with education incorporating structured Atoin Amaf involvement. Such studies should also assess the sustainability of behavioural changes, antenatal care utilisation, maternal nutritional status, and child growth.

The Atoin Amaf social capital model offers a culturally grounded conceptual framework linking maternal health education with family and community support. Its novelty lies in integrating changes in knowledge, attitudes, and practices with locally embedded social capital mechanisms. However, its effectiveness in improving antenatal care utilisation and supporting stunting prevention requires further empirical validation through controlled studies with adequate follow-up.

4. CONCLUSION

In conclusion, the results show the importance of including husbands, families, Atoin Amaf, community health volunteers, the broader community, and health workers in supporting prenatal care. Even though the pilot evaluation showed improvements in knowledge, attitude, and behavior scores after the intervention, the single-group design (lacking a control group) cannot establish a causal effect or report stunting prevention. Meanwhile, the qualitative results indicate increased acceptance of maternal health services at health facilities and continued gaps in the consistency of family support. Outcomes for postpartum women and infants are not evaluated in the reported results. In this context, follow-up in the first 1,000 days of life should be framed as a recommendation for subsequent implementation and evaluation.

CONFLICT OF INTEREST

The authors declared no conflicts of interest.

ETHICAL CONSIDERATIONS

This study received ethical approval from the Ethics Committee of the Kupang Health Polytechnic of the Ministry of Health (reference number LB.02.03/1/0090/2026), and all informants provided informed consent before data collection.

AUTHOR CONTRIBUTIONS

Ina Debora Ratu Ludji contributed to the conceptualization, study design, supervision of data collection, quantitative and qualitative data analysis, drafting of the manuscript, interpretation of findings, and critical revision of the manuscript. Mariana Ngudju Awang and Karolus Ngambut contributed to the literature review. Juni Gressilda L. Sine and Matje M. Huru assisted with administrative tasks, data collection, and the provision of health promotion to pregnant women. Maria Sekunda contributed to data analysis, and Fransiskus Salesius Onggang contributed to coordination and data analysis. Cecilia Martha Evita Asy Cecilia Martha Evita Asy contributed to data collection and investigation. Helen Bradley contributed to the study design and literature review. All authors have reviewed and revised the manuscript and approved its final version.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were used in the preparation, writing, editing, or submission of this manuscript. All aspects of the research, including the study design, data collection, data analysis, interpretation of the findings, manuscript preparation, and the decision to submit the manuscript for publication, were conducted solely by the authors. The authors take full responsibility for the accuracy, originality, and integrity of the manuscript.

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