



Integrated Situational Analysis of Chronic Energy Deficiency to Inform A Community-Based Mentoring Model in Indonesia

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Abstract

Maternal malnutrition in Central Lombok remains a challenge. This study aimed to identify multilevel determinants of chronic energy deficiency among pregnant women through an integrated situational analysis using a mixed-methods approach to inform a community-based mentoring model in Indonesia. A sequential exploratory mixed-methods design was conducted in 2025 at the district health office and five community health centers. The qualitative phase used purposive sampling of stakeholders and cadres, while the quantitative phase included 206 pregnant women with mid-upper arm circumference (MUAC) <23.5 cm selected through cluster random sampling. The dependent variable was MUAC status, with independent variables including maternal characteristics, dietary intake, food taboos, antenatal care (ANC), iron-folate supplementation, mentoring exposure, knowledge, and attitudes. Data were analyzed using contingency coefficients and multiple logistic regression. Food taboos were reported by 43.2% and were significantly associated with MUAC ($p=0.023$). Energy and protein inadequacy were 91.3% and 84.0%, respectively. ANC attendance (94.7%) and iron-folate use (91.3%) were high. High-risk maternal age increased the odds of lower MUAC (OR=2.364; 95% CI:1.208–4.629), while higher education decreased the odds (OR=0.528; 95% CI:0.279–0.998). Mentoring exposure (OR=2.636; 95% CI:1.238–5.612) and parity (OR=1.610; 95% CI:1.122–2.310) were also significant. These findings inform community-based mentoring models focusing on dietary behavior and social context.

Introduction

Chronic Energy Deficiency (CED) in pregnancy remains a substantive public health concern in Indonesia and Southeast Asia. CED denotes prolonged inadequacy of energy and protein intake and is clinically indicated by MidUpper Arm Circumference (MUAC) < 23.5 cm (Ministry of Health of the Republic of Indonesia, 2023; Tejayanti, 2019). CED is associated with a higher likelihood of maternal anemia, preterm birth, and low birth weight, with downstream effects on neonatal survival and early child development (Wati *et al.*, 2024;

Nadimin & Asikin, 2025). At the national level, recent estimates indicate that the prevalence of CED among pregnant women remains above 17 percent, with a greater burden observed in rural areas (Health Research and Development Agency, 2019; Hasriantirisa, 2023). The 2023 Indonesian Health Survey (IHS) reported a CED prevalence of 16.9 percent, which exceeded the national target of 11.5 percent for that year (Ministry of Health Indonesian Republic, 2020; Ministry of Health of the Republic of Indonesia, 2023).

Subnational patterns also show a

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persistent burden. In Nusa Tenggara Barat (NTB), administrative performance reports documented an increase in CED among pregnant women from 12.9 percent in 2021 to 15.97 percent in 2022, followed by only a slight decline in 2023 (approximately 0.27 percentage points) (Ministry of Health Republic of Indonesia, 2023). In Central Lombok, the reported prevalence was 15.8 percent in 2023 and had reached 19.1 percent by March (Central Lombok Health Office, 2023; National Population and Family Planning Agency, 2024). These findings support the need to examine context-specific determinants and intervention designs beyond general education or supplementation. At the regional level, evidence syntheses continue to highlight maternal undernutrition, often measured through MUAC, particularly among adolescents and households experiencing socioeconomic vulnerability (Angraini *et al.*, 2023). Although reducing maternal undernutrition is a national policy priority in Indonesia, progress has varied considerably across provinces and districts, suggesting that local cultural norms, food environments, and service delivery conditions shape both risk and program performance.

Multiple interrelated factors influence nutrition during pregnancy. Sociodemographic characteristics such as maternal age, education, parity, household income, and employment are consistently linked to low MUAC risk (Hermawati & Hanjarwati, 2022; Eze, Ani & Anoshirike, 2024; Isnaeny, 2024; Regalado & Acosta, 2025). Cultural food beliefs are also important: pregnancy-related taboos may restrict access to protein and micronutrient-dense foods and reduce dietary diversity, although their direct association with MUAC remains mixed and may be mediated by other factors (Bhanbhro *et al.*, 2020; Abere & Azene, 2023; Jessica *et al.*, 2024). Foods containing protein and other micronutrients can improve the nutritional status of pregnant women (Nahdyah *et al.*, 2025). Service utilization adds another dimension: Antenatal Care (ANC) creates opportunities for nutrition counseling and iron-folate supplementation (Tablet Tambah Darah, TTD), but fragmented implementation and limited family engagement can weaken behavior change efforts (Kurian

et al., 2021; Nguyen *et al.*, 2021; Suranny & Maharani, 2021; Shreffler *et al.*, 2024; Hussain *et al.*, 2025).

A socio-ecological and multi-sectoral perspective is therefore widely recommended, with community health cadres and family members recognized as key actors in shaping everyday practices, social support, and supporting access to ANC (Wau & Razella, 2020; Negash *et al.*, 2022; Kusumawati *et al.*, 2024). Experiences from several Indonesian provinces suggest several promising, though unevenly implemented, approaches: family-engaged mentoring (Nadimin & Asikin, 2025), community-led initiatives that connect nutrition education with local agriculture (Suranny & Maharani, 2021), and locally produced fortified foods using culturally acceptable ingredients (Suranny & Maharani, 2021), and local fortification using culturally acceptable ingredients (Setyawati, Sumarmi & Hutagaol, 2024). However, existing evidence is often fragmented by intervention component, such as taboos, supplementation, or service contact, and is seldom brought together within an integrated, theory-informed assessment that can clarify what should be delivered, how it should be delivered, and which system-level supports are needed (Boucher *et al.*, 2022; Negash *et al.*, 2022; Setyawati *et al.*, 2024; Muliadi *et al.*, 2025).

Digital or remote counseling, including WhatsApp-based education, may help extend program reach, but context-specific evidence regarding long-term effectiveness and rural-urban differences remains limited (Yanti & Komalyna, 2022). At the same time, multi-sector coordination platforms such as Tim Percepatan Penurunan Stunting (TPPS) and local regulations such as Peraturan Bupati (Perbup) are already in place, yet linked data systems and integrated assessment frameworks remain inconsistent. This limits the translation of policy into tailored household-level strategies (Hamka & Ibrahim, 2025; Suyanti, 2025). In NTB, and particularly in Central Lombok, these implementation constraints, together with the persistently high prevalence of CED, justify a grounded situational analysis that combines epidemiologic profiling (age, education, parity), sociocultural assessment (taboos

and norms), program behavior (ANC/TTD), dietary adequacy (energy and protein intake), and the administrative and policy context (coordination, resources, and monitoring)

This study undertakes such an integrated situational analysis by applying PRECEDE–PROCEED constructs (predisposing, enabling, and reinforcing) across socio-ecological levels (individual, interpersonal, community, and policy) to generate actionable insights for a culturally grounded, community-based mentoring model for women with CED in Central Lombok. This analysis represents the Analysis phase of an R&D process based on the ADDIE framework (Analysis, Design, Development, Implementation, Evaluation), providing the empirical foundation and design requirements before prototyping and testing. The main objectives are to describe the prevalence and distribution of indicators across the social, epidemiologic, education/ecology, and administration/policy domains; to examine associations between selected determinants and CED category as measured by MUAC; and to identify implementation barriers and enabling factors for prospective mentoring strategies delivered through existing multi-sector platforms, including community cadres, district TPPS, and Perbup. In line with the study findings, epidemiologic factors (age risk and education) and social or program-related constraints (parity, taboos, energy and protein deficits, and limited mentoring exposure) are interpreted as associations rather than assumed causal effects, while the proposed mentoring model is framed as a response to observed constraints rather than as a proven solution.

Methods

This study used a sequential exploratory mixed-methods design (qualitative → quantitative) to examine the multilevel determinants of maternal malnutrition in Central Lombok, Indonesia. The qualitative phase preceded and informed the quantitative phase by identifying contextual factors and generating input for instrument development. (Dossett *et al.*, 2020; Åkerblad, Seppänen-Järvelä & Haapakoski, 2021; Wasti *et al.*, 2022; Phaladi, 2023). The study was conducted in Central Lombok Regency, specifically at

the Health Office and Community Health Centers (Puskesmas): Sengkol, Teratak, Mujur, Pringgarata, and Batunyala. The study population included district-level program stakeholders, community health workers (cadres), and pregnant women with chronic energy deficiency, defined as a mid-upper arm circumference (MUAC) <23.5 cm. In the qualitative phase, purposive sampling was conducted, involving six district-level informants (the Head of the Public Health Division and the coordinator of the Nutrition, Health Promotion, and Maternal and Child Health programs) and two community health workers, to ensure representation at the policy, program, and community levels. Specifically, it explored sociocultural, behavioral, and programmatic factors related to chronic energy deficiency among pregnant women, including barriers to nutritional practices, community beliefs, and support systems at the family, local community, and health-service levels. In the quantitative phase, cluster random sampling was conducted from a population of 756 pregnant women in the CED, resulting in a final sample of 206 participants proportionally distributed across all facilities: Sengkol (65), Teratak (37), Mujur (32), Pringgarata (38), and Batunyala (34). The use of cluster sampling was justified by its alignment with facility-based service catchment areas and its efficiency in resource-constrained settings (Donough, 2022; Taljaard *et al.*, 2025).

The primary outcome was MUAC, measured using standardized procedures by 10 trained enumerators and health workers. For analysis, MUAC was categorized into two study-specific groups based on the sample median (22.5 cm): <22.5 cm and ≥22.5 cm to <23.5 cm. Independent variables included sociodemographic characteristics (maternal age, education, parity, employment, household income, and trimester), social factors (dietary restrictions), educational and ecological factors (knowledge, attitudes, dietary intake, and exposure to guidance), and program-related behaviors (use of antenatal care and iron-folate supplementation). Knowledge and attitudes were assessed using validated or adapted instruments with acceptable reliability (Cronbach's alpha: 0.711 and 0.840). Dietary

intake was measured using a 24-hour dietary recall method with a multi-pass approach supported by a portion size estimation tool and categorized into levels of adequacy. Dietary intake was assessed using a 24-hour recall method with a multi-pass approach, supported by a portion-size tool, and categorized into adequacy levels for energy, protein, carbohydrate, and fat (Ransdell *et al.*, 2021; Anderson *et al.*, 2023). Counseling exposure was recorded as a binary variable (ever/never) with additional descriptors of actor, frequency, and content. Antenatal care utilization and iron-folate consumption were recorded as categorical and count variables. Program behaviors included antenatal care utilization (ever/never) and iron-folate (IFN) consumption measured as present vs. absent and by tablet counting, taking into account skewed compliance distributions that are best summarized using median, interquartile range, or categorized reporting (Pham *et al.*, 2023; Sukumaran *et al.*, 2023; Kriegbaum *et al.*, 2024). Qualitative data were collected through one focus group discussion with district stakeholders and in-depth interviews with community cadres using a semi-structured guide aligned with Precede-proceed constructs and socioecological levels. All sessions were audio-recorded, transcribed verbatim, and documented using an audit trail. Quantitative data collection was conducted in one visit per participant (approximately 30–40 minutes), including mid-upper arm circumference (MUAC) measurement, questionnaire administration, and dietary recall. Data collectors were trained in standard measurement procedures, probing techniques for dietary recall, and data quality assurance. Primary data sources included interviews, questionnaires, and direct measurements, while secondary data were obtained from health center records and maternal cohort registers.

Qualitative data were analyzed using a thematic procedure based on Sugiyono's framework, including data reduction, coding, categorization, and theme development supported by NVivo software. Quantitative data were analyzed using SPSS version 16.0. Univariate analysis was performed to describe the distribution of variables using frequencies and percentages. Bivariate analysis used

the contingency coefficient test to assess associations between variables. Multivariate analysis using logistic regression was performed to identify factors independently associated with MUAC status, with results presented as odds ratios (OR) and 95% confidence intervals. The Faculty of Public Health's Research Ethics Committee at Universitas Diponegoro provided ethical permission (No.387/EA/KEPL-FKM/2024). After explaining the steps, the fact that participation was voluntary, and the privacy guarantees, each person gave their informed consent. When needed, people were sent to normal services.

Results and Discussion

The quantitative cohort comprised 206 pregnant women meeting the inclusion criterion midupper arm circumference (MUAC/LILA) < 23.5 cm. For profiling within this undernourished cohort, MUAC was dichotomized at the sample median (22.5 cm) into lower MUAC (< 22.5 cm; $n = 113$; 54.9%) and higher MUAC (≥ 22.5 and < 23.5 cm; $n = 93$; 45.1%). These labels are study-specific and do not imply clinical severity. Qualitative material came from district program managers (Public Health Division; Maternal and Child Health; Health Promotion; Nutrition) and community cadres; role-coded excerpts appear in Appendix I.

Shapiro–Wilk tests indicated nonnormal distributions for MUAC/LILA ($p < 0.001$), knowledge ($p = 0.001$), and attitude ($p = 0.011$). Accordingly, we report counts and percentages; continuous measures that required categorization (e.g., MUAC subgroups) use the median split, while the demographics criteria used in this study are: High-risk age (< 19 or > 35 years), 29.1%; 19–35 years, 70.9%. Education: basic 32.5%; secondary/tertiary 67.5%. Employment: not working 91.7%. Household income below district minimum wage 87.9%. Gestation: trimester I 20.9%, II 46.1%, III 33.0%.

Pregnancy-related food taboos were reported by 43.2% (none 56.8%). 69.9% had never received supplemental food (ever 30.1%). Iron-folate tablet use was high by “any use” (91.3% vs 8.7% none), but tablet counts were highly rightskewed, ranging from 1–32 tablets,

TABLE 1. Food Taboos and MUAC Subgroup

Food taboo status	Lower MUAC (< 22.5 cm)	Higher MUAC (≥ 22.5 cm)	Total	p-value
Present	50 (56.2%)	39 (43.8%)	89	0.023*
None	63 (53.8%)	54 (46.2%)	117	
Total	113 (54.9%)	93 (45.1%)	206	

* contingency coefficients $< 0,05$

Primary Data (2026)

with many at very low counts (e.g., 1 tablet: 19.4% of the total cohort) and very few at the upper end (e.g., 30–32 tablets: 0.5% each). Furthermore, the service use, mentoring, predisposition, and diet results show antenatal care attendance was 94.7% (ever). Healthfacility visit regularity: routine 42.2%, sometimes 45.6%, never 12.1%. Mentoring exposure (*pendampingan*) was limited (ever 20.9%; never 79.1%). Knowledge: poor 59.2%, good 40.8%. Attitude: poor 54.4%, good 45.6%. Diet adequacy: energy inadequate 91.3%, protein inadequate 84.0%, with higher adequacy for carbohydrate 96.6% and fat 80.1%. Parity: nulipara 36.4%, primigravida 30.1%, multigravida 33.5% (see Table 1 in Appendix II for details).

Table 1 shows that food taboos (*pantangan*) were common: 43.2% reported at least one taboo; 56.8% reported none ($N = 206$). The bivariate relationship between taboos and the MUAC subgroup was statistically significant ($p = 0.023$; contingency coefficient < 0.05) using the study median for mid-upper arm circumference (22.5 cm). 56.2% of women with taboos belonged to the lower MUAC subgroup, and 43.8% to the higher subgroup; 53.8% of women without taboos belonged to the lower subgroup, and 46.2% to the higher. This suggests that the poorer MUAC subgroup in this cohort also adheres to taboos.

Informants detailed long-standing bans like squid, prawns, and ‘hanging’ veggies like cucumbers. Restrictions on nutrient-dense foods, particularly seafood, which would normally increase protein and micronutrient intake, and social enforcement by influential relatives (for example, mothers-in-law), which limits dietary variation and counselling compliance, are two reinforcing processes that have been identified. Informants detailed long-standing prohibitions on items such as

squid, shrimp, and hanging vegetables like cucumbers. Restrictions on nutrient-dense foods, particularly seafood, which would typically increase protein and micronutrient intake, and social enforcement by influential relatives (e.g., mothers-in-law), which limits dietary variety and counseling compliance, are two reinforcement processes that have been identified. The following is a sample excerpt about food taboos (coded by role; translation). “For pregnant women, there are several myths that sometimes make them avoid certain foods... There are things that, by belief or conviction, should not be consumed during pregnancy.” (KI-2) “Pregnant women still believe in taboos, such as squid, shrimps, and ‘hanging’ vegetables like cucumbers.” (Shyntesis form informant narrative). “The surrounding environment really influences them... the people they listen to most are in-laws or parents. When we ask who forbids the food, the answer is often ‘the mother-in-law’” (KI-3)

Among 206 pregnant women with midupper arm circumference (see Table 2) < 23.5 cm, 29.1% were in a highrisk age group (< 19 or > 35 years) and 70.9% were 19–35 years. Education: 32.5% basic and 67.5% secondary/tertiary. 91.7% of respondents are not working. 87.9% less than the district minimum wage. Trimesters I, II, and III: 20.9%, 46.1%, and 33.0%, respectively. Early pregnancy and financial limitations were identified by program administrators as persistent hazards; routine data gaps were also observed

Maternal age risk and education were significant predictors in the logistic regression (Table 3) (outcome: lower subgroup < 22.5 cm vs. higher ≥ 22.5 cm, among women with

TABLE 2. Epidemiologic Characteristics of Participants (N = 206)

Variables	Categories	n	%
Maternal age risk	< 19 or > 35 years	60	29.1
	19–35 years	146	70.9
Education	Basic	67	32.5
	Secondary/Tertiary	139	67.5
Employment	Not working	189	91.7
	Working	17	8.3
Household income	< District minimum wage	181	87.9
	≥ District minimum wage	25	12.1
Gestational trimester	I	43	20.9
	II	95	46.1
	III	68	33.0

Primary Data (2025)

mid upper arm circumference < 23.5 cm); employment, household income, and trimester were not. Highrisk age was associated with higher odds of belonging to the lower subgroup ($p = 0.012$; odds ratio 2.364; 95% CI 1.208–4.629). Secondary/tertiary education was associated with lower odds ($p = 0.049$; odds ratio 0.528; 95% CI 0.279–0.998). These results reflect qualitative reports that young pregnancy and economic constraints shape dietary patterns and engagement with services, as expressed by the following informant: “CED cases are rather stagnant...many pre-pregnancies under 19 years remain, and economic factors play a role (KI-1).” “From the latest entries, one community health center has not yet completed data input; the 2024 KIA tally shows about 11%.”(KI-4).

Within the cohort (all midupper arm circumference < 23.5 cm), predisposing factors skewed suboptimal: knowledge poor 59.2% / good 40.8%; attitude poor 54.4% / good 45.6%. Diet adequacy shortfalls were pronounced for energy inadequate 91.3% and protein inadequate 84.0%; carbohydrate adequate 96.6%, fat adequate 80.1%. Program behaviors: antenatal care (ever) 94.7%; healthfacility visits routine 42.2% / sometimes 45.6% / never 12.1%. Mentoring exposure ever 20.9% / never 79.1% (see Table 4).

Logistic regression predicted lower MUAC (< 22.5 cm) compared to higher MUAC (≥ 22.5 and < 23.5 cm) among women with arm circumference < 23.5 cm. Mentoring exposure (ever vs never) was associated with higher odds

of being in the lower MUAC subgroup ($p = 0.012$; odds ratio 2.636; 95% CI 1.238–5.612), consistent with the study’s outcome coding (lower = 1, and higher = 0). Additionally, risks were raised by parity (per category) ($p = 0.010$; odds ratio 1.610; 95% CI 1.122–2.310). There were no statistically significant other covariates in this block. Since parity is included in the study’s education/ecology criteria, we keep it in our model for transparency.

Despite the availability of services, behavioral and home variables that may restrict food quality were revealed through interviews. While attitudes regarding pregnancy and taste-driven food choices frequently overshadow nutritional value (KI-5) (“*Women tend to judge food by taste rather than nutritional adequacy*”). Informants stressed that knowledge gaps can persist across educational strata (KI-1) (“*CED occurs across the spectrum... even among those with higher education*”). Practical limitations also surfaced, such as poor meal preparation (“*foods are sometimes reheated repeatedly*”). On the enabling side (KI-1), informants mentioned the availability of facilities (“*posyandu are available even in remote areas*”), but emphasised that community reinforcement is uneven (“*the voices most heeded are in-laws or parents*”) and that mentoring is often deferred to midwives. This highlights the need for family-inclusive, cadre-supported mentoring to translate counselling into long-lasting dietary improvements.

To overcome maternal malnutrition,

TABLE 3. Logistic Regression Predicting Lower MUAC Subgroup (< 22.5 cm) Among Women with MUAC < 23.5 cm (N = 206)

Predictors	Odds ratio (Exp(B))	95% CI lower	95% CI upper
Maternal age risk (< 19 or > 35 vs 19–35)	2.364	1.208	4.629
Education (Secondary/Tertiary vs Basic)	0.528	0.279	0.998
Employment (Working vs Not working)	1.493	0.514	4.334
Household income ($\geq$ vs < district minimum wage)	1.277	0.510	3.196
Trimester (per ordered increase)	1.318	0.890	1.951

*Logistic Regression < 0.05

Primary Data (2025)

TABLE 4. Education/Ecology Characteristics (N = 206)

Domains	Variables	Categories	n	%
Predisposing	Knowledge	Poor	122	59.2
		Good	84	40.8
	Attitude	Poor	112	54.4
		Good	94	45.6
Diet adequacy	Energy	Adequate	18	8.7
		Inadequate	188	91.3
	Protein	Adequate	33	16.0
		Inadequate	173	84.0
	Carbohydrate	Adequate	199	96.6
		Inadequate	7	3.4
	Fat	Adequate	165	80.1
		Inadequate	41	19.9
Program behaviors	ANC (ever)	No	11	5.3
		Yes	195	94.7
	Health-facility visits	Never	25	12.1
		Sometimes	94	45.6
Reinforcing	Mentoring exposure	Routine	87	42.2
		Never	163	79.1
		Ever	43	20.9

Primary Data (2025)

TABLE 5. Logistic Regression: Education and Ecology Predictors of Lower MUAC Subgroup (< 22.5 cm) among Women with MUAC < 23.5 cm (N = 206)

Predictors	Coding / Reference	p-value	Odds ratio (Exp(B))	95% CI lower	95% CI upper
Knowledge	Good vs Poor (ref = Poor)	0.136	1.636	0.856	3.127
Attitude	Good vs Poor (ref = Poor)	0.058	0.534	0.279	1.020
Energy adequacy	Inadequate vs Adequate (ref = Adequate)	0.913	1.080	0.271	4.296
Protein adequacy	Inadequate vs Adequate (ref = Adequate)	0.120	1.945	0.841	4.499
Carbohydrate adequacy	Inadequate vs Adequate (ref = Adequate)	0.278	2.852	0.429	18.976
Fat adequacy	Inadequate vs Adequate (ref = Adequate)	0.120	1.945	0.841	4.499
Antenatal care	Ever vs Never (ref = Never)	0.354	2.026	0.455	9.017
Healthfacility visits	Per category (Never → Sometimes → Routine)	0.954	0.987	0.620	1.569
Parity	Per category (Nullipara → Primigravida → Multigravida)	0.010*	1.610	1.122	2.310
Mentoring exposure	Ever vs Never (ref = Never)	0.012*	2.636	1.238	5.612

*Logistic Regression < 0.05

Primary Data (2025)

Central Lombok's administrative architecture includes multi-sector coordination platforms and a structured regulatory framework (Table 7). A Decree on the Foster-Parent Movement for homes at risk and an operational Regent Regulation on Accelerating Stunting Reduction (Perbup No. 5/2024) that specifically mentions undernourished pregnant women were reported by stakeholders. The District Stunting Acceleration Team (TPPS), which is led by the deputy regent and includes the District Health Office and BKKBN, is responsible for integrating local policies that are framed as derivatives of national directives. *"There is a regent regulation—Perbup No. 5 of 2024—addressing stunting acceleration, and it also discusses pregnant women with undernutrition ... We issue local regulations as downstream of higher-level policies; the TPPS includes BKKBN and the Health Office."* (KI-4).

Although the structure is in place, informants pointed out implementation flaws,

especially the inconsistent involvement of other government agencies outside of the health sector and the poorer coordination below the district level (sub-district to village): *"It's not yet optimal... still limited."* said one manager (Informant: Public Health Division) *"We have TPPS at the district, but below that, in sub-districts and villages, coordination is still lacking."* said another (KI-4) The reach and consistency of counselling, supplementation, and household-level support may be limited by these governance gaps, which can also disperse ownership of maternal nutrition initiatives. Distribution methods (such as iron-folate pills) are generally in place, but effective consumption is not assured, according to program leads' accounts: *"In general, distribution reaches pregnant women's hands, but not all consume the tablets."* (KI-3). In a similar vein, many eligible women do not regularly receive or utilise additional nutrients. Regulations authorise programs, but micro-level adherence depends on family beliefs,

follow-up, and support areas where mentorship can transform policy meaning into everyday behaviours. These challenges link policy to practice. Additionally, informants emphasised how data fragmentation within programs (such as KI-3, KI-4, and KI-2) makes monitoring and collaborative decision-making more difficult: *“Cross-program collaboration needs to be strengthened... stunting data must match between Health Promotion and Nutrition, and with KIA and disease control.”* (KI-4) Trends are further obscured by incomplete or delayed facility-level entries: *“One Puskesmas has not completed data entry....”* (KI-4). This emphasises the necessity of standardising indicators, harmonising registers, and creating straightforward, common monitoring tools (such as contact logs and adherence checklists) that both midwives and cadres can use.

Practically speaking, to ensure that mentoring is specifically included in stunting/nutrition programs with express requirements, a community-based mentoring model should be linked to current policy and coordination mechanisms that formally coincide with Perbup No. 5/2024 and the district TPPS. The approach requires operational integration in order to transform policy into daily practice.

This includes regular coordination check-ins at the sub-district and village levels (e.g., mini-TPPS or standing sector meetings) and specified referral loops between cadres and midwives. Mentoring sessions must combine behavioural reinforcement (myth-busting, side-effect management) with basic adherence tracking, such as counting TTD tablets taken, verifying ANC contacts, and keeping track of weekly food objectives, as distribution does not equal consumption. To enable cadre-midwife teams to provide consistent data to TPPS dashboards, data should be harmonised using a common indicator set and simple technologies (such as paper registrations or WhatsApp forms). Lastly, to ensure that multi-sector policies result in observable, household-level nutritional gains, the model should extend ownership beyond health by involving food security and agriculture offices to connect households with food-access supports (such as home-garden inputs and vouchers for protein sources).

The relationship between multilevel factors and maternal malnutrition among pregnant women whose mid-upper arm circumference is less than 23.5 centimetres

TABLE 6. Administrative/Policy Theme Matrix

Themes	What we found	Exemplar quotes (roles)	Implication for mentoring model
Regulatory framework	Perbup No. 5/2024 addresses stunting and includes pregnant women with maternal undernutrition; local decrees support targeted actions.	“There is a regent regulation—Perbup No. 5 of 2024—... it also discusses pregnant women with undernutrition... We make regulations as a derivative of national policy.” (District Nutrition Coordinator)	Establish mentoring as a named activity in district plans/SK with clear targets and reporting lines.
Multi-sector platform (TPPS)	TPPS chaired by deputy regent; includes BKKBN and Health Office.	“...All relevant agencies are included—BKKBN, the Health Office... the deputy regent chairs TPPS.” (District Nutrition Coordinator)	Use TPPS to convene sectors, endorse mentoring SOPs, and remove bottlenecks (e.g., transport for cadres, supplies).

Coordination below district	Sub-district/village coordination not yet optimal; OPD engagement uneven.	“Not yet optimal...” (Public Health Division)	Schedule sub-district coordination huddles; assign focal persons; integrate mentoring in village health days/posyandu.
Program delivery vs uptake	Distribution of TTD/supplemental foods occurs, but consumption/use is inconsistent.	“Distribution reaches pregnant women, but not all consume [the tablets].” (Health Promotion/Promkes)	Mentor on adherence (side-effects, reminders); track dose taken; escalate persistent non-use via midwife/cadre follow-up.
Data systems & linkage	Fragmented data across Promkes–Nutrition–KIA/P2; facility entries sometimes incomplete.	“Cross-program collaboration needs strengthening... stunting data must match between units.” (District Nutrition Coordinator)	Create a shared mentoring register; standardize indicators (contacts, TTD taken, diet goals); feedback to TPPS dashboard.
Community influence	Family actors (e.g., in-laws) strongly shape decisions.	“The surrounding environment influences them... the people they listen to most are in-laws or parents.” (Health Promotion/Promkes)	Build family-inclusive sessions; involve respected community figures to reinforce messages and reduce taboo pressure.

Primary Data (2025)

was investigated in this mixed-methods situational analysis. The results can be used to create a community-based mentoring model. In adjusted analyses, maternal age risk (younger than 19 years or older than 35 years) was associated with higher odds of belonging to the lower arm circumference subgroup ($p = 0.012$; odds ratio 2.364; 95 percent confidence interval 1.208–4.629), while secondary or tertiary education was associated with lower odds ($p = 0.049$; odds ratio 0.528; 95 percent confidence interval 0.279–0.998). Within the education and ecology block, mentoring exposure (ever) was associated with higher

odds of being in the lower subgroup ($p = 0.012$; odds ratio 2.636; 95 percent confidence interval 1.238–5.612), and parity also showed a positive association ($p = 0.010$; odds ratio 1.610; 95 percent confidence interval 1.122–2.310). Descriptively, large shortfalls persisted for energy and protein intake, antenatal care contact was high but mentoring exposure was limited, and food taboos were common and bivariately associated with the lower subgroup. These results are interpreted as associations rather than causal effects and should be read in light of clustered sampling without design adjustment, a study-specific median split for

arm circumference, a singleday dietary recall, and mentoring coded as ever or never with unknown intensity and potential selection into exposure.

The social patterning here is consistent with reports that everyday dietary choices are shaped by belief-driven constraints reinforced by powerful family members and can mitigate the impact of one-time counselling. Informants described prohibitions on seafood and “hanging” vegetables that are embedded in norms and enforced within households, a configuration consistent with literature showing that family and community support can mediate adherence to guidance, mitigate stigma or misinformation, and facilitate practical problemsolving around food acquisition and preparation (Ernawati *et al.*, 2021; Billah *et al.*, 2022; Maliha *et al.*, 2022; Sanghvi *et al.*, 2022; Putri *et al.*, 2023; Setiyadi *et al.*, 2025). In this context, the high prevalence of energy and protein inadequacy provides a plausible channel by which taboos could reduce dietary diversity and limit intake of protein and micronutrient-dense foods without presuming a direct causal pathway from norms to anthropometry.

Knowledge and attitude were not statistically significant in adjusted models within the education and ecology domain, but when integrated into efficient delivery systems that incorporate social reinforcement, they may serve as upstream enablers. It is important to exercise caution when interpreting the relationship between exposure to mentorship and belonging to the lower group. An odds ratio above one indicates higher odds of the lower subgroup among those reporting exposure, given the outcome coding (lower equals one); this finding may be the result of residual confounding that cannot be resolved in this cross-sectional design, targeted outreach to women deemed at risk, or coding ambiguities. However, the larger body of research suggests that by combining customised knowledge transfer with frequent interaction and problem solving, mentoring and family or cadre support can enhance adherence to prenatal care, supplement use, and dietary practices (Rina & Meliati, 2020; Sarker *et al.*, 2021; Maliha *et al.*, 2022; Putri *et al.*, 2023; Zelka *et al.*, 2023; Setiyadi *et al.*, 2025). The observed energy

and protein gaps point to workable solutions, such as weekly diet micro goals that call for structured prototyping rather than inference of effect, family inclusive counselling to renegotiate taboos, and budgeting for protein sources, and nudging and barrier management for iron folate tablets.

It is reasonable to present the suggested mentoring model as a reaction to limitations rather than a tried-and-true solution. The district environment includes venues for collaboration and supporting policy instruments, but it also has fragmented data systems and inconsistent execution. A family-inclusive structure centered on a community cadre, the local midwife, and a designated family supporter; a regular schedule of contacts through home visits and mobile reminders; content that specifically addresses taboo negotiation, energy and protein deficiencies, prenatal scheduling, and iron-folate problem solving; and lightweight monitoring of reach, dose, and basic household level markers like tablets actually taken, kept appointments, and diet micro goals accomplished are among the design requirements that emerge from the evidence. Clear role definitions, institutional support, ongoing communication, customized content, and feedback for adaptive management are essential components of long-lasting mentoring programs, according to program design literature (Brown *et al.*, 2020; Fairchild *et al.*, 2020; Stelter *et al.*, 2020; Plourde *et al.*, 2021; García-Cardo, Queiruga-Dios & Queiruga-Dios, 2023). Aligning these specifications with existing platforms that can authorize procedures and coordinate resources increases feasibility and reach and addresses recurrent barriers related to training, supervision, and motivation (Stefaniak & Dmoch-Gajzlerska, 2021; Naidoo *et al.*, 2022; Winderbaum & Coventry, 2024).

It is not possible to establish a temporal ordering between exposures (such as mentoring, knowledge, and attitudes) and mid-upper arm circumference because this cross-sectional study supports relationships rather than causal inferences. The quantitative survey employed cluster sampling by Puskesmas; however, the analysis did not account for clustering, which can inflate statistical significance and understate standard errors; design-aware

estimators should be used in subsequent reanalyses. A single 24-hour recall was used to measure dietary intake, which is susceptible to recall bias and daily variability; habitual or seasonal consumption may be misrepresented (Madeghe *et al.*, no date; Mei *et al.*, 2020; Lagares *et al.*, 2021; Junaid *et al.*, 2024). In a cohort that was already malnourished, a number of continuous variables were non-normal, and the mid upper arm circumference was dichotomized at the study median (22.5 cm); although this facilitates communication, median splits provide less information than continuous analyses (Blebil *et al.*, 2022; Pham *et al.*, 2023; Sukumaran *et al.*, 2023; Kriegbaum *et al.*, 2024). Without intensity, actor, or topic information, mentoring exposure was labeled as ever versus never, which could lead to misclassification and restrict dose-response evaluation. Heterogeneity in categories, enforcement circumstances, and frequency may be overstated because the taboo taxonomy was inevitably crude. Generalizability outside comparable settings is unknown due to the district and service-based nature of the sample (Chakravarty *et al.*, 2021; Clayton & Nganga, 2022; Ko *et al.*, 2023; Kargbo-Labour *et al.*, 2024; Walker *et al.*, 2024).

The results demonstrate implementable and policy-aligned measures that incorporate recommendations into standard practice without overstating their impact. Standard operating procedures for a community-based or family-based mentoring model assisted by cadres and midwives can be based on the current district platform, local regulations (Regent Regulations), and the Stunting Reduction Acceleration Team (TPPS). Each pregnant woman should have a designated family supporter, community cadres, community members, and a local midwife. Recognizing that a one-time therapy is not sufficient for behavioral change, contact must be consistent and ongoing (home visits combined with mobile reminders). Content should focus on the following mechanisms: (1) negotiating taboos with families using culturally acceptable substitutions that protect dietary diversity; (2) energy and protein micronutrient targets formulated as small, cost-effective steps; and (3) adherence support that treats “distribution ≠

consumption,” including scheduling support for prenatal care and troubleshooting for iron folate side effects. To keep implementation simple, districts can use a simple shared register (paper or mobile) to track: reach (enrolled women, with markers for adolescents, low-income, and remote), dose (number and timing of contacts), and three household-level markers: iron folate tablets actually taken, antenatal appointments met, and weekly dietary micronutrient targets achieved. Regular TPPS coordination meetings can use these data to make adaptive changes to the frequency and content of contacts.

Conclusions

Maternal undernutrition in Central Lombok results from many social, epidemiologic, behavioral, and systemic factors. Pregnancy-related food taboos are prevalent in society and, when enforced by families, limit dietary diversity, especially protein, which is consistent with their bivariate association with the lower-MUAC subgroup. According to epidemiology, risk is concentrated in women over 35 and teenagers, while higher education is protective, suggesting the need for support that is age and education responsive. Mentoring exposure is the most actionable correlate of improved MUAC (lower probabilities of the lower-MUAC subgroup) in the education/ecology domain, with parity adding vulnerability despite major energy and protein shortages. Administratively, there is policy scaffolding (such as Perbup/TPPS), but the impact is limited by fragmented data, inconsistent sub-district coordination, and distribution gaps in consumption. A community-based mentoring strategy involving inclusive midwives-cadres for families with predictable contact (home visits plus WhatsApp reminders), anti-taboo counseling, protein-focused micro-goals, and simple adherence tracking for iron and prenatal care (ANC) should be instituted by districts. TPPS should connect households with food access resources (e.g., home garden inputs, protein vouchers), prioritize adolescents, mothers over 35, households with less education, and households with more children, and coordinate monitoring across health promotion, nutrition, and maternal and child health (KIA). This integrated strategy

provides a feasible way to improve dietary quality and adherence, translate policies into household behavior, and increase mid-upper arm circumference (MUAC).

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