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Determinants of Maternal Malnutrition and Child Health in Balanga LGA, Gombe State, Nigeria: A Qualitative Study

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ABSTRACT

Maternal malnutrition remains a key driver of adverse birth outcomes in sub-Saharan Africa, yet contextual evidence on multi-level determinants in north-eastern Nigeria is scarce. This study explored how socio-cultural, environmental, and health-system factors shape maternal nutrition and child health in Balanga Local Government Area (LGA), Gombe State. An exploratory qualitative design underpinned by interpretive phenomenology was employed. Two focus-group discussions (n = 20), five in-depth interviews, and twelve key-informant interviews were conducted among pregnant women, health workers and governance actors. Data were analysed thematically using NVivo 14 and triangulated across sources. Carbohydrate dominance (97% consumed tuwo daily) was reinforced by cultural prohibitions: 70% avoided eggs due to "theft destiny" beliefs. The 2019 Balanga Dam collapse reduced irrigated area from 11 000 ha to ess-than 2 000 ha, raised dried-fish prices by 180% and cut dietary diversity from 28% to 18%. Antenatal care attendance averaged 2.9 visits; 64% of facilities lacked haemoglobinometry. Participants attributed low birth-weight, stunting and delayed vaccination to "weak blood" from maternal undernutrition. Maternal malnutrition in Balanga LGA is produced by intersecting cultural taboos, agronomic shock and health-system challenges. An integrated package of point-of-care diagnostics, conditional e-vouchers and irrigation rehabilitation could avert maternal and child death caused by low birth weight and maternal malnutrition. The findings can be adapted by other Sub-Saharan African countries experiencing similar environmental instability and gendered food allocation.

INTRODUCTION

Maternal malnutrition, a composite of protein-energy deficiency and chronic micronutrient insufficiency, remains the primary modifiable driver of adverse perinatal outcomes (Abubakar *et al.*, 2023). Global 2023 estimates attribute millions of pregnancies to maternal underweight, while in Nigeria, 57% of gestations are burdened by anaemia a figure peaking at 65% in the North-east (National Population Commission (NPC) & ICF, 2024; World Health Organization (WHO), 2023). Meta-analytic evidence confirms a significant dose–response relationship: declining maternal haemoglobin and pre-pregnancy BMI directly elevate the odds of low birthweight (LBW) and preterm labour (Victora *et al.*, 2021).

Beyond the neonatal period, intrauterine nutrient restriction "programmes" permanent deficits in linear growth and cognitive capacity (Hoddinott *et al.*, 2023). These early-life insults translate into a 16% reduction in adult wage-earning potential, thereby perpetuating inter-generational poverty (Victora *et al.*, 2021). Despite national mandates like the National Policy on Food and Nutrition 2023–2027, demand-side uptake in rural areas remains sub-optimal (Federal Ministry of Health (FMOH), 2023). In Balanga LGA, Gombe State, these structural drivers are exacerbated by environmental shocks such as the 2019 irrigation collapse and entrenched cultural prohibitions that restrict access to essential animal proteins (Gombe State Government, 2023; Musa *et al.*, 2022).

LITERATURE REVIEW

Addressing maternal and child malnutrition remains a critical global imperative, yet progress remains uneven (Victora *et al.*, 2021). While the WHO Global Nutrition Targets for 2025 and the UN Sustainable Development Goals (SDGs) aim to eliminate all forms of malnutrition by 2030, recent reviews suggest these ambitions may not be met without localized institutional readiness (World Health Organization (WHO), 2023). Solving these multilayered issues requires an encompassing approach focusing on three primary drivers: food security, care practices, and environmental stability (Abubakar *et al.*, 2023).

Nigeria currently faces a paradoxical "double burden" of malnutrition, where persistent gestational underweight in rural zones coexists with rising urban obesity (National Population Commission (NPC) & ICF, 2024). The 2023 National Demographic and Health Survey documents a 57% national anaemia prevalence among pregnant women, with the North-east recording the highest burden at 65% (NPC & ICF, 2024). This disparity is intensified by a rural–urban gradient, where 20% of northern rural women are underweight compared to 9% in southern urban areas (NPC & ICF, 2024).

Supply-side efforts, such as the National Policy on Food and Nutrition 2023–2027, have increased the distribution

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of iron–folic acid (IFA) tablets, yet demand-side uptake remains sub-optimal due to structural barriers (Federal Ministry of Health (FMOH), 2023). Only 38% of pregnant women in the North-east achieve the necessary IFA consumption threshold, and fewer than 25% attain minimum dietary diversity (NPC & ICF, 2024; Victora *et al.*, 2021). These deficits are primarily driven by seasonal food insecurity, protracted regional conflict, and culturally embedded prohibitions that restrict access to essential animal proteins during pregnancy (Musa *et al.*, 2022).

Maternal nutritional compromise in rural North-eastern Nigeria is generated through a nested hierarchy of influences that operate concomitantly (Abubakar *et al.*, 2023). At the structural level, environmental shocks have become a dominant driver of food insecurity. In Balanga LGA, the 2019 collapse of the Balanga Dam reduced functional irrigation from 11,000 to less than 2,000 hectares, effectively eliminating off-season harvests and precipitating a 180% increase in the price of essential proteins like dried fish (Gombe State Government, 2023; Musa *et al.*, 2022). Consequently, the proportion of households achieving minimum dietary diversity plummeted from 28% to 18% post-breach, as families were forced to substitute micronutrient-dense foods with cheaper energy-dense staples (Gombe State Government, 2024).

These environmental pressures are exacerbated by systemic failures within the health-care infrastructure. The 2022 Nigeria Service Provision Assessment reveals a diagnostic vacuum: 64% of primary healthcare (PHC) facilities lack functional haemoglobinometers, while 42% report frequent stock-outs of iron–folic acid (IFA) supplements (Federal Ministry of Health (FMOH), 2023). Furthermore, human-resource density in the North-east remains critically low, averaging only 1.2 nurses or midwives per facility far below the national minimum standard of four (FMOH, 2023; National Population Commission (NPC) & ICF, 2024).

These institutional deficits are compounded by entrenched socio-cultural norms that prioritize male household heads in food allocation, often leaving pregnant women to consume leftovers (Musa *et al.*, 2022). Governance fragmentation further stalls progress, as nutrition financing is split across multiple ministries with no statutory transfers to local government levels, leaving 85% of LGAs without a dedicated nutrition budget line (Federal Ministry of Health (FMOH), 2023). Collectively, these factors transform a clinical nutritional issue into a profound structural and humanitarian challenge.

Study Aim and Objectives

Our overarching aim was to generate contextual evidence to inform the design of maternal nutrition interventions within Balanga's PHC platform. Specific objectives were:

1. To describe current dietary practices and cultural beliefs that modulate maternal nutrition.
2. To identify socio-economic and environmental determinants that interfers with maternal malnutrition.
3. To explore health-system factors that facilitate or impede adequate nutrition.
4. To examine community perceptions of the causal pathways linking maternal nutrition to birth outcomes and child health.

MATERIALS AND METHODS

Research Paradigm and Design

This study utilized an exploratory qualitative methodology underpinned by interpretive phenomenology to clarify the symbolic meanings and structural determinants configuring maternal nutrition practices in Balanga Local Government Area (LGA). This orientation privileges emic insight over enumerative generalization, aligning with current frameworks for investigating gestational dietary behaviors in conflict-affected and environmentally stressed zones (Abubakar *et al.*, 2023). By focusing on the lived experiences of participants, the design sought to uncover how multi-level factors intersect to produce nutritional outcomes (Braun & Clarke, 2022).

Study Setting

Balanga LGA is situated within the south-eastern agro-ecological quadrant of Gombe State, Nigeria, covering 2,746 km² of Sudan savannah. The 2022 population projection estimated 364,100 inhabitants, reflecting a 2.9% annual growth rate (National Population Commission (NPC), 2023). The region's food security was significantly altered by the 2019 collapse of the Balanga Multipurpose Dam, which reduced functional irrigation from 11,000 to less than 2,000 hectares and eliminated dry-season horticulture that historically provided 15% of household micronutrient intake (Gombe State Agricultural Development Programme (GSADP), 2024). Public health infrastructure is limited, with only 13 primary healthcare facilities serving the population, many of which lack essential diagnostic tools for maternal care (Federal Ministry of Health (FMOH), 2023).

Study Population and Eligibility Criteria

Four analytic strata were purposively sampled: (i) pregnant women attending PHC services, (ii) pregnant women not utilizing formal services, (iii) front-line health workers (nurses, midwives, community health extension workers, nutrition focal persons), and (iv) governance actors (LGA nutrition officers, ward development committee chairpersons, traditional birth attendants, community leaders).

Inclusion criteria: Pregnant women more than 15years of age, resident for greater-than 12 months, and capable of providing informed consent. Health workers and governance actors required greater than 6 months of service within the LGA.

Exclusion criteria: Women who were not pregnant and not living within the sampled areas as at the time of the study, health workers and community leaders not within the study area, and governance actors not working in the selected LGA (Balanga). Lastly individuals who declined

consent to participate.

Sampling Frame and Sample Size

The principle of thematic saturation governed all sampling decisions, with a-priori estimates derived from comparable phenomenological studies indicating that 25–30 encounters within homogeneous strata and 12–15 within heterogeneous categories would suffice to achieve informational redundancy. Accordingly, the empirical corpus ultimately encompassed two trimester-stratified focus-group discussions comprising 10–12 PHC-attending pregnant women each (n = 20), five in-depth interviews with pregnant women who had not engaged formal antenatal services and who were identified through community-informant chain referral, and twelve key-informant interviews with purposively selected health-system and governance actors (duration 30–70 minutes), thereby ensuring representativeness across the continuum of maternal nutrition experience and service provision.

Recruitment Procedures

Community health extension workers and Mama-to-Mama volunteers generated a purposive roster of pregnant women across the eleven wards. Non-attendees were recruited via snowball sampling commencing with traditional birth attendants. The recruitment of non-attendees was to ensure inclusivity of all respondents as only 61% of pregnant mothers received ANC from skilled providers for Gombe State according to NDHS 2023 report. Key Informant Interview (KII) participants were selected based on functional expertise and jurisdictional responsibility. Written informed consent was obtained; literate respondents signed, while illiterate participants affixed a thumbprint in the presence of an impartial witness. Transport reimbursement (₦500) and refreshments were provided; no monetary incentive was offered.

Data Collection Instruments and Process

Semi-structured guides developed in English were translated into Fulfulde and Hausa, then back translated to ensure semantic equivalence. Domains included: dietary practices, cultural proscriptions, food-access trajectories, ANC experiences, service-delivery barriers, and perceived consequences for birth outcomes. Pilot testing in Kwami LGA (n=4) led to minor wording improvement. FGDs were conducted in neutral community halls, lasted 60–90 minutes, were audio-recorded and moderated by a trained female qualitative researcher accompanied by a note-taker. In-depth Interviews (IDIs) and KIIs were undertaken in participants' preferred language at a private venue, digitally recorded, and transcribed verbatim within 24 hours by bilingual transcribers. Field notes captured paralinguistic and contextual nuances.

Ethical Considerations

Ethical clearance was obtained from the Gombe State Health Research Ethics Committee (reference GMEHREC/SMOH/2025/2025). Administrative permission was secured from the Balanga LGA Chairperson and facility heads. Confidentiality was maintained through anonymization of transcripts, assignment of unique identifiers, and secure storage of encrypted audio files on a password-protected device. Participants were informed of their right to withdraw at any time without penalty.

Data Analysis

Transcripts were imported into NVivo 14 (QSR International) for management and coding. Thematic analysis proceeded through six iterative phases: (i) familiarization via repeated reading; (ii) generation of initial codes inductively from the corpus; (iii) organization of codes into candidate themes mapped deductively to the UNICEF socio-ecological typology (enabling, underlying, immediate); (iv) refinement through constant comparison and deviant-case analysis; (v) triangulation across FGD, IDI and KII sources to enhance credibility; (vi) synthesis of definitive themes with illustrative quotations. Two researchers (OOA and BMY) coded independently; inter-coder agreement exceeded 85% (Cohen's κ=0.81); (vii) Measurement of household food access was done using the Household Food Insecurity Access Scale (HFIAS). Discrepancies were resolved through discussion with a third senior qualitative researcher (JMA). Saturation was decided when no new thematic properties emerged across three successive interviews.

RESULTS AND DISCUSSION

Dietary Practices and Cultural Restrictions Shaping Maternal Nutrition

Pregnant women's diets in Balanga LGA were overwhelmingly carbohydrate-dominant, with minimal intake of protein-rich and micronutrient-dense foods. Cultural taboos, particularly egg and poultry restrictions, strongly shaped dietary patterns. Household food-allocation norms further reinforced these restrictions, often prioritizing male household members. Although most women demonstrated basic nutrition knowledge, actual dietary practices remained constrained by entrenched socio-cultural expectations. Maternal diets were overwhelmingly carbohydrate-dominant, with tuwo (maize/sorghum pudding) consumed by 97 percent (19/20) of Focused Group Discussion (FGD) participants on the preceding day. Protein-rich items were periodic: only 5 percent (1/20) reported egg ingestion, while fish and poultry were recalled in 15 percent and 10 percent of 24-hour dietary recalls, respectively. Cultural restrictions were widespread: 14/20 FGD participants and 4/5 IDI respondents cited the belief that "egg ingestion begets thieving offspring" (Participant 2-FGD1). A 30-year-old gravida 3 stated: "If I eat eggs my child will steal in the market; my mother-in-law forbids it" (IDI-3). Health workers corroborated the persistence of taboos: "Eggs and chicken are forbidden in most

households; we spend ANC time dispelling myths rather than counselling balanced diets" (KII-08, Deputy State MCH Coordinator). Knowledge-practice disjunction was evident: although 18/20 FGD participants could enumerate iron-rich foods, only 2/20 reported consuming them at least three times week⁻¹. Seasonal modulation intensified restrictions: during the late rainy season okra and sesame leaves were avoided because "slippery soups cause difficult labour (FGD-2, P5).

Beyond individual prohibitions, collective dietary rituals reinforced carbohydrate dominance. Evening meals were described as "familial communion" centred around a single large pot of tuwo, with protein items when available reserved for male household heads and school-age boys. A 34-year-old businesswoman summarized: "Chicken is for guests and husbands; pregnant women are told to 'manage' with soup alone" (FGD-1). Such normative allocation was transmitted inter-generationally: 16/20 participants reported receiving identical instructions from mothers or mothers-in-law. Health-system actors acknowledged limited traction in counter-messaging: "We advise eggs, but grandmothers have stronger power over us than the healthcare workers" (KII-07, Nutrition Focal Person). Consequently, micronutrient adequacy was routinely subordinated to symbolic compliance with kinship hierarchies.

Socio-Economic And Environmental Determinants

Using the Household Food Insecurity Access Scale (HFIAS), the result showed a severe score (score at least 4) in 17/20 FGD households. Poverty constrained dietary diversity: median monthly food expenditure was ₦8500 (approximately USD 6.1), representing 62 percent of total cash outflow. A 34-year-old petty trader summarized: "When beans cost ₦120 per mudu, we choose maize at ₦60; nutrition becomes luxury" (FGD-1). The collapsed Balanga Dam emerged as a dominant structural driver. All 12 key informants linked the 2019 irrigation failure to dwindling dry season harvests and rising fish prices. A facility manager observed: "Before the dam break down a woman could buy dried fish with ₦50; now ₦200 buys three tiny pieces. Animal protein disappears from family pots" (KII-09). Gendered intra-household allocation compounded scarcity: 13/20 FGD participants reported eating last or consuming leftovers. Patrilineal norms restricted women's mobility: 8/20 were prohibited from engaging in income-generating farm labour, thereby limiting independent purchasing power. Seasonal hunger recurred predictably: the "hunger gap" (July–September) coincided with peak gestational energy demand, reducing meal frequency from three to one per day in 11/20 households.

Environmental shocks intersected with market dysfunctions to amplify nutrient deficits. Focus-group narratives traced a causal chain: dam failure to reduced dry-season harvest to diminished market supply to price inflation and to household substitution toward cheaper energy-dense staples. Quantitative triangulation confirmed this trajectory: the Gombe State Agricultural Development Programme documented a 145 percent real-term rise in leafy-vegetable prices and 180 percent in dried fish between 2020 and 2023. Consequently, the proportion of households achieving minimum dietary diversity (at least 5 food groups) fell from 28 percent pre-breach (2018) to 18 percent post-breach (2023). Women's economic agency remained circumscribed: 6/20 participants who attempted backyard gardening cited land-access constraints and unavailability of water "My husband allocates the best plots to cash crops, not vegetables" (FGD-2, P4) illustrating how gendered resource tenure mediates environmental shock impacts on maternal diets.

Health System Determinants

ANC utilization was sub-optimal: mean gestational attendance was 2.9 visits (range 0–5) versus the national four-contact standard. Cost surfaced as the principal barrier: 4/5 non-attending women cited "transport fare absence" as the deterrent. A 32-year-old primigravida stated: "The facility is 7 km; motorcycle costs ₦700. My husband earns ₦1,000 daily choosing between food and ANC is routine" (IDI-4). Service-availability deficits paralyzed demand: 6/12 KII respondents reported Iron Folic Acid stock-outs lasting at least 21 days in the preceding quarter; 8/12 facilities lacked functional haemoglobinometers. Laboratory capacity was virtually absent: none of the 13 PHCs could perform malaria microscopy or urine protein analysis on site. A deputy state nutrition officer lamented: "We counsel anaemia prevention but cannot measure haemoglobin; credibility erodes" (KII-05). Nutrition counselling was equally fragmented: only 3/13 facilities had a trained nutrition focal person; remaining staff provided ad-hoc advice, often conflating "balanced diet" with "eating three times". Waiting time exceeded 90 minutes in 9/13 facilities, discouraging repeat visits. Integration gaps were noted: no formal referral pathway linked PHC nutrition counselling to LGA agricultural extension services for household food-production support.

Quality-of-care deficits were compounded by poor human-resource distribution. The 2022 Service Provision Assessment documented 1.2 nurses/midwives per PHC in the study zone below the National Primary Health Care Development Agency (NPHCDA) minimum of 4. Consequently, task-shifting to community health extension workers (CHEWs) occurred in practice, yet CHEWs lacked nutrition-specific training modules: "We repeat what senior nurses say; we have no curriculum on maternal diets" (KII-06, CHEW). Supervisory flux further weakened service fidelity; only 4/13 facilities received quarterly supportive supervision from the LGA nutrition unit in 2023. These problems have reduced both the quality of care and trust in ANC services provided.

Perceived Consequences of Maternal Malnutrition on Child Health

Participants generally link poor maternal nutrition to adverse birth outcomes. In FGDs, 18/20 women

associated "small baby at birth" with maternal food shortage. A 33-year-old mother of five recalled: "When I skipped meals my baby weighed 1.8 kg he could not suck, needed hospital warmth for weeks" (FGD-2). Health workers corroborated: "We record 3–4 LBW cases monthly; most mothers admit eating only maize porridge in third trimester" (KII-11, facility manager). Stunting was projected as a sequela: "If the womb is starved, the child remains short even at school look at my neighbour's son" (FGD-1, P3). Immunological vulnerability was emphasized: 10/20 participants believed "weak blood" (anaemia) caused recurrent malaria and delayed wound healing. Breastfeeding challenges emerged: 6/20 women reported insufficient milk flow, attributing it to "empty stomach" during lactation. A traditional birth attendant summarized community epidemiology: "Babies born after hunger months look pale, start fever early, and finish immunization schedule late" (KII-12).

Long-term developmental sequelae were implicitly acknowledged. When prompted, 8/20 participants associated school "slow learning" with "small size at birth," indicating an implicit causal narrative. Health professionals extended the temporal lens: "Intrauterine growth restriction not only lowers birth-weight but also reduces nephron endowment and lung volume; we see these children later with chronic bronchitis and early hypertension" (KII-10, Deputy Director Planning). No respondent spontaneously cited cognitive impairment, yet 5/12 key informants invoked "poor classroom concentration" as a downstream effect. Thus, community narratives and provider observations converged on a life course trajectory wherein gestational nutrient insult translates into immediate anthropometric deficit, heightened infection susceptibility, and diminished human-capital potential.

Discussion of the Findings

Dietary Practices and Cultural Proscriptions

The finding that only 5% of pregnant women consumed eggs and 15% consumed fish corroborates recent evidence of persistent animal-protein avoidance in rural Northern Nigeria (Abubakar *et al.*, 2023). This study extends the literature by quantifying the "theft destiny" sanction, where 70% of participants avoided eggs due to beliefs that it predetermines a child's criminal future. This aligns with contemporary findings in Sub-Saharan Africa where cultural myths regarding fetal development such as babies being born without hair continue to dictate maternal food choices (Musa *et al.*, 2022). Furthermore, the documented avoidance of "slippery" foods (okra and sesame) during late pregnancy to prevent "slippery labor" suggests that taboos are not static but are dynamically amplified by environmental stressors (Abubakar *et al.*, 2023). These rules function as a form of symbolic capital deployed by elder women to maintain authority, suggesting that behavior-change strategies must be intergenerational rather than focused solely on the individual (Victora *et al.*, 2021).

Socio-Economic and Environmental Determinants

The median food expenditure share of 62% in Balanga LGA significantly exceeds the national rural average of 52% reported in the 2022 Nigerian Living Standards Survey, indicating extreme consumption vulnerability (National Bureau of Statistics (NBS), 2023). The 2019 Balanga Dam collapse serves as a primary structural driver; the subsequent 180% spike in dried fish prices and 145% rise in leafy vegetable prices directly correlate with a drop in dietary diversity from 28% to 18% (Gombe State Agricultural Development Programme (GSADP), 2024). This identifies a critical "double burden" where environmental shock is mediated through patriarchal resource control, as 40% of women were restricted from income-generating labor during peak nutrient demand (Doss *et al.*, 2021). These findings mirror recent global reports indicating that irrigation infrastructure failure reduces micronutrient supply by up to 22% in agrarian communities (Food and Agriculture Organization (FAO), 2022).

Health-System Determinants

Mean ANC attendance (2.9 visits) remains below the WHO-recommended eight-contact model (World Health Organization (WHO), 2023). While distance is often cited as a barrier, granular cost analysis shows that transport fares can absorb up to 70% of a household's daily income, making demand highly price-elastic (Federal Ministry of Health (FMOH), 2023). The diagnostic vacuum is equally critical: 64% of facilities lacked functional haemoglobinometry, undermining the clinical credibility of anemia prevention programs (FMOH, 2023). Furthermore, the absence of nutrition-specific curricula for Community Health Extension Workers (CHEWs) leads to oversimplified counseling, where a "balanced diet" is erroneously equated with mere meal frequency (Musa *et al.*, 2022).

Perceived Consequences of Maternal Malnutrition on Child Health

Community attribution of low birth weight (LBW) to maternal food shortages aligns with global meta-analytic evidence showing that declining maternal dietary diversity significantly raises the odds of LBW and preterm labor (Victora *et al.*, 2021). Local narratives linking "weak blood" to recurrent malaria and delayed vaccination timeliness suggest that community members perceive a clear link between gestational nutrition and immunological fragility (Sealey *et al.*, 2021; Unger *et al.*, 2022). These perceptions of early-life "fragility" could be leveraged to design more effective, behaviorally-tailored vaccine demand interventions, as intrauterine nutrient restriction is now recognized to "programme" permanent deficits in linear growth and cognitive capacity (Hoddinott *et al.*, 2023).

Implications for Policy and Practice

The convergence of cultural proscriptions, agronomic shock and health-system frailty in Balanga LGA demands

a multi-sectoral response that transcends conventional siloed interventions. We propose an integrated three-pronged package: (i) point-of-care haemoglobinometry and 30-day iron–folic acid buffer stocks at all antenatal care sites; (ii) conditional e-voucher (₦3 000 quarterly) routed to pregnant women's mobile wallets, redeemable for nutrient-dense foods during the hunger gap; and (iii) phased rehabilitation of the Balanga Dam irrigation canals (Phases I–II, 4 000 ha) coupled with extension support for women-run vegetable cooperatives. Preliminary cost-utility analysis indicates that the bundle could avert an estimated 240 cases of low birth-weight and 1 100 cases of maternal anaemia annually at an incremental cost-effectiveness ratio of USD 42 per disability-adjusted life-year averted (Appendix 3). Implementation should leverage Nigeria's Primary Health Care Re-engineering Agenda by embedding nutrition diagnostics within the routine antenatal package and creating a formal referral conduit between health facilities and local agricultural extension services.

Strengths and Limitations

The study's strengths include methodological triangulation across focus-group discussions, in-depth interviews and key-informant interviews, iterative independent coding (Cohen's $\varkappa = 0.81$), and the first emic documentation of the Balanga Dam collapse as a maternal nutrition determinant. Geographic specificity to Balanga LGA, however, limits external validity to other agro-ecological zones. The self-funded nature of the project precluded member-checking beyond the community level, although deviant-case analysis was employed to enhance dependability. Finally, the qualitative design rules out quantification of attributable fractions; mixed-methods follow-up would better estimate population-level impact.

CONCLUSION

Maternal malnutrition in Balanga LGA reflects a structural challenge driven by cultural food taboos, seasonal agricultural instability, and weak health service delivery. The 2019 Balanga Dam collapse has further deepened food insecurity, transforming an environmental problem into a public health concern. In addition, household food allocation norms that prioritize men limit pregnant women's access to nutrient-dense foods. Despite these constraints, both pregnant women and healthcare workers demonstrate clear awareness of the drivers of poor nutrition and propose practical solutions such as improved diagnostics, nutrition support, and irrigation rehabilitation. Addressing maternal malnutrition therefore requires integrated health, agricultural, and community-based interventions.

Recommendation

1. Pilot an integrated intervention combining point-of-care haemoglobin testing, conditional food e-vouchers, and phased rehabilitation of Balanga Dam irrigation canals.
2. Mobilize development financing to support irrigation repair and nutrition support for pregnant women.
3. Integrate community behaviour-change sessions targeting husbands and mothers-in-law to address food taboos.
4. Deploy handheld haemoglobin diagnostics and strengthen iron–folic acid supply monitoring.
5. Support women-led vegetable cooperatives linked to rehabilitated irrigation blocks.
6. Conduct a cluster-randomised evaluation to assess impacts on maternal anaemia and low birth weight.

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