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Synergistic Moringa and Ginger Agronutritional Therapy for Tuberculosis-Associated Malnutrition: A Descriptive Case Report

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ABSTRACT

Tuberculosis (TB) exacerbates malnutrition through systemic inflammation and anti-TB drug side effects, necessitating cost-effective, culturally congruent interventions. A descriptive qualitative multiple-case report involving two adult TB patients at a community health center in Indonesia. Data were collected via interviews, anthropometry, and clinical observation during three structured home visits (days 1, 3, and 7), while the Moringa-Ginger tea intervention was administered daily over a 7-day period. Both patients demonstrated improved gastrointestinal tolerance, marked by reduced nausea and relief from anti-tuberculosis drug (ATD)-related dyspepsia, alongside an increase in meal frequency (3 to 4 times/day). A slight increase in body weight (+0.04 to +0.06 kg) was also observed, though this remains within the range of normal daily physiological fluctuation. Family nutritional management knowledge improved from 55–60% to 85–90%, and patient anxiety scores decreased (from 5–6/10 to 2–3/10). Moringa-Ginger therapy appeared to be a well-tolerated, affordable, and complementary intervention with the potential to improve gastrointestinal tolerance and family independence for TB malnutrition, though normalizing BMI requires ongoing intervention (at least 14–28 days).

Keywords: *Malnutrition; Moringa oleifera; Tuberculosis; Zingiber officinale.*

INTRODUCTION

Tuberculosis (TB) remains a formidable global public health challenge, with the World Health Organization (WHO) estimating more than 10 million new cases annually (WHO, 2023, 2024). Indonesia bears the second-highest TB burden globally (Rahmawati et al., 2024; WHO, 2024). Specifically, East Java Province ranks among the three provinces with the highest number of notified TB cases (Kementerian Kesehatan Republik Indonesia, 2023), and city-level TB programmes in the province continue to face implementation challenges (Ramadhani et al., 2025). In 2024, the proportion of confirmed TB cases in Pasuruan City reached 71.9% (Dinas Kesehatan Kota Pasuruan, 2024). Despite advancements in

pharmacological treatments, nutritional deficit persists as a critical, yet frequently undermanaged, complication that severely compromises clinical prognosis and treatment adherence. The intersection of infectious disease and malnutrition creates a complex clinical scenario that demands holistic, community-based nursing interventions.

The pathophysiology of TB-induced malnutrition is multifactorial, driven by a synergistic interplay of chronic infection and pharmacological side effects. Active *Mycobacterium tuberculosis* infection triggers a systemic inflammatory response, releasing pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β (Gunasekaran et al., 2025). This cascade promotes anorexia and accelerates protein catabolism, contributing to TB-associated wasting (Özer & Gündoğan, 2024; Schwenk & Macallan, 2000). Concurrently, first-line Anti-Tuberculosis Drugs (ATDs), particularly rifampicin and isoniazid, frequently induce gastrointestinal distress, anorexia, and hepatotoxicity, creating a vicious cycle of reduced oral intake and progressive weight loss (Fâcă et al., 2025; Hermawan et al., 2025).

Furthermore, the psychological burden of TB, particularly stress, significantly compromises treatment adherence and recovery outcomes. Recent studies utilizing the Health Belief Model (HBM) highlight that sociodemographic factors such as low education, unemployment, and unmarried status are strong predictors of high stress levels among TB patients, which in turn act as perceived barriers to successful treatment (Wibowo et al., 2025). To ensure treatment success, prevent treatment dropouts, and avoid the emergence of multidrug-resistant TB (MDR-TB), the active involvement of Drug Swallowing Supervisors (PMO) and robust family support systems are paramount in monitoring medication intake and providing continuous encouragement (Huda et al., 2024).

To disrupt this pathological cycle, there is a growing imperative to explore evidence-based, localized nutritional therapies. *Moringa oleifera* has emerged as a "nutritional powerhouse," offering dense concentrations of bioavailable plant-based protein, iron, calcium, and antioxidants like quercetin, which are crucial for tissue regeneration and immunomodulation (Kandinata et al., 2023; Panova et al., 2025). When synergistically combined with *Zingiber officinale* (ginger), which contains active phenolic compounds (gingerols and shogaols) known for potent gastroprotective and anti-inflammatory properties, the intervention addresses both the nutritional deficit and the ATD-induced gastrointestinal intolerance (Aji & Nabella, 2024; Rahman et al., 2024).

Despite the theoretical benefits, literature detailing the structured, family-centered implementation of this specific Moringa-Ginger composite therapy in community settings remains scarce. Most existing interventions rely on expensive commercial supplements that are economically unsustainable for low-income households (Kusrini et al., 2024; Setiawan et al., 2022). Therefore, this study aims to describe the implementation and clinical outcomes of a localized Moringa-Ginger nutritional therapy integrated within a family-centered nursing framework for pulmonary TB patients experiencing nutritional deficits, addressing a critical gap in community health nursing practice (Lutfian et al., 2025; Pomalango et al., 2025).

OBJECTIVE

To describe nursing care for nutritional deficit in patients with pulmonary tuberculosis using local Moringa-Ginger nutritional therapy in the working area of Sekargadung Community Health Center, Pasuruan City.

METHOD

Research Design

This study employed a descriptive qualitative multiple-case report design.

Population and Sample

Two participants were purposively selected based on stringent inclusion criteria: patients aged 15–60 years actively undergoing ATD treatment without interruption, exhibiting >10% weight loss, and possessing active family support. Exclusion criteria included severe comorbidities (e.g., advanced HIV/AIDS, severe renal failure). Case 1 was a 59-year-old female (Ny. M, baseline BMI 15.6 kg/m²), and Case 2 was a 45-year-old male (Tn. B, baseline BMI 16.1 kg/m²).

Time and Place of Research

The study was conducted at the Sekargadung Community Health Center (Puskesmas), Pasuruan City, Indonesia, between May 8 and May 14, 2026.

Data Collection

Data were gathered over three structured home visits (days 1, 3, and 7). Methods included semi-structured interviews to assess dietary habits and anxiety levels, systematic clinical observations (including gastrointestinal tolerance), and precise anthropometric measurements (weight and height to calculate BMI).

Data Analysis

Qualitative data were analyzed inductively, following the systematic process of data reduction, data display, and conclusion drawing/verification (Miles et al., 2014). Triangulation of data sources (patient interview, family report, and clinical observation) was employed to ensure data validity.

Ethical Consideration

Ethical approval was obtained from the Institutional Ethics Committee of the Faculty of Nursing, Universitas Jember (Ethical approval number 230/UN25.1.14/KEPK/2026). Written informed consent was securely obtained from both participants and their primary caregivers, guaranteeing strict anonymity, data confidentiality, and the unconditional right to withdraw from the study at any time.

RESULT

The implementation of the localized Moringa-Ginger composite nutritional therapy over a seven-day intervention period yielded consistent, positive clinical and behavioral trends across both participants. Both patients demonstrated excellent tolerance to the intervention, with no adverse gastrointestinal effects reported when the therapy was administered strictly two hours post-anti-tuberculosis drug (ATD) consumption.

The detailed day-by-day progression of anthropometric, dietary, gastrointestinal, psychological, and family-level outcomes is presented in Tables 1 and 2. As depicted in the tables, both cases exhibited a modest increase in body weight (+0.04 to +0.06 kg) and BMI over the 7-day intervention; given the short observation period, this change falls within the range of normal daily physiological fluctuation and is reported cautiously rather than as definitive evidence of a metabolic shift from a catabolic to an anabolic state. More consistently, dietary intake improved, characterized by an increase in both meal frequency (from 3 to 4 times/day) and portion size. Furthermore, ATD-induced gastrointestinal distress diminished after the ginger component was introduced, with nausea and early satiety noticeably reduced by day 3 and resolved by day 7. Psychologically, patient anxiety scores decreased in both cases (Case 1: from 6/10 to 3/10; Case 2: from 5/10 to 2/10). Concurrently, family nutritional management knowledge increased (Case 1: from 60% to 90%; Case 2: from 55% to 85%), culminating in the families' ability to independently prepare and schedule the composite tea by the final day of the intervention without further nursing supervision.

DISCUSSION

Efficacy of Localized Nutritional Therapy

The findings demonstrate a positive, albeit modest, shift in anthropometric parameters for both patients. A weight gain of 0.04–0.06 kg over seven days remains within the range of normal daily physiological fluctuation (e.g., hydration status and gastrointestinal contents) and is not, on its own, sufficiently valid evidence of a metabolic shift from a catabolic to an anabolic state or of improved nutritional status. Instead, the resolution of gastrointestinal symptoms caused by ATD side effects (nausea and dyspepsia) and the increase in family independence are prioritized here as the primary short-term outcomes of this intervention. This aligns with recent literature indicating that *Moringa oleifera* acts as a highly bioavailable nutritional supplement, providing essential amino acids and micronutrients that directly counteract TB-induced muscle wasting and anemia (Panova et al., 2025). The addition of ginger may enhance nutrient absorption by improving gastrointestinal motility, thereby helping to break the vicious cycle of malnutrition and TB progression (Fâcă et al., 2025; Özer & Gündoğan, 2024).

Mitigation of Anti-Tuberculosis Drug Side Effects

A critical finding was the marked reduction in nausea and early satiety. First-line ATDs are notorious for inducing gastric irritation, which severely compromises oral intake (Fu et al., 2023; Hermawan et al., 2025). The ginger component contains active phenolic compounds that exhibit potent gastroprotective properties by inhibiting cyclooxygenase-2 (COX-2) and reducing pro-inflammatory cytokines (TNF-α, IL-6) (Haniadka et al., 2013; Mao et al., 2019). Administering the tea strictly two hours post-ATD was intended to minimize potential pharmacokinetic interactions while preserving this protective effect, which may support overall treatment adherence.

The Role of Family-Centered Care

The marked increase in family nutritional management knowledge (from 55–60% to 85–90%) underscores the validity of the "Family as a Unit of Care" model. By training family members to act as "home nutritionists" and Drug Swallowing Supervisors (PMO) within the Directly Observed Treatment, Short-course (DOTS) strategy, the intervention transitions from a clinical directive to a sustainable, culturally congruent household practice (Dana et al., 2025; Lutfian et al., 2025). This empowerment coincided with the observed reduction in patient anxiety, as familial support buffers the psychological distress associated with chronic illness (Mediarti et al., 2024; Rahmawati et al., 2024).

CONCLUSION

The integration of a localized, Moringa-Ginger composite nutritional therapy within a family-centered nursing framework represents a promising complementary approach to supporting the management of tuberculosis-associated malnutrition. Given that this study is a case report involving two subjects observed over 7 days, its effectiveness cannot yet be firmly concluded. This complementary therapy appeared well tolerated, is affordable, and has the potential to improve gastrointestinal tolerance and family independence, although normalizing BMI requires ongoing intervention (at least 14–28 days).

Study Limitation

This study has several limitations. First, the small sample size (n=2) and short duration (7 days) limit the generalizability of the findings and the ability to observe clinically significant long-term BMI normalization. Second, the reliance on self-reported dietary intake may introduce recall bias. Third, biochemical markers (e.g., serum albumin, prealbumin) were not measured due to resource constraints in the community setting. It should also be emphasized that the observed weight change of 40–60 grams over seven days remains within the range of

normal daily physiological fluctuation and should not be interpreted as conclusive evidence of improved nutritional status. Future research should employ a longer-term randomized controlled trial (RCT), conducted over a minimum of 1–2 months with larger sample sizes, incorporating biochemical endpoints such as serum albumin and hemoglobin levels, to more definitively establish the efficacy of this intervention.

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Table 1. Clinical and Behavioral Progression of Moringa-Ginger Nutritional Therapy in Case 1 (Ny. M, 59-year-old female TB patient)

Day / Date	Anthropometry and Dietary Intake	Gastrointestinal Tolerance and ATD Adherence	Psychological Status (Anxiety)	Family Engagement and Self-Efficacy
Day 1 (May 8, 2026)	BW: 35.0 kg BMI: 15.6 kg/m² Intake: 4 tbsp/meal, 3x/day. Target: 2,100 kcal/day (high protein).	GI Status: Early satiety, ATD-induced nausea. Intervention: Moringa-Ginger tea (1.3 g + 0.7 g in 150 mL hot water) introduced strictly 2 h post-ATD. Tolerance: No vomiting or diarrhea.	Score: 6/10 (High). Symptoms: Restless, tense, sleep disturbance, highly dependent on husband. Action: 4-7-8 deep breathing introduced (3 reps).	Caregiver: Husband (Tn. H). Baseline Knowledge: 60%. Role: Involved in initial education and meal preparation.
Day 3 (May 10, 2026)	BW: 35.01 kg Intake: Increased to 5 tbsp/meal, 3x/day. Subjective: Reduced physical weakness.	GI Status: Nausea noticeably reduced. Physical: Mild improvement in chewing/swallowing muscle strength and mucosal pallor. Tolerance: Excellent; tea consumed consistently.	Score: 5/10 (Moderate). Symptoms: Less rigid posture. Action: Distraction therapy added (listening to Murottal and family storytelling).	Caregiver: Tn. H. Role: Actively assisted in portioning small, frequent meals and brewing the tea according to SOP.
Day 7 (May 14, 2026)	BW: 35.04 kg BMI: 15.7 kg/m² Intake: 6 tbsp/meal, 4x/day (3 main + 1 snack).	GI Status: Early satiety and ATD-induced nausea significantly resolved. Physical: Mucosa turned pink; muscle fatigue decreased.	Score: 3/10 (Mild). Symptoms: Relaxed face, open posture, improved sleep. Cognition: Accepts that recovery is gradual.	Knowledge: 90%. Role: Mastered tea preparation SOP. Ready for independent home care and long-term treatment supervision (PMO role).

Table 2. Clinical and Behavioral Progression of Moringa-Ginger Nutritional Therapy in Case 2 (Tn. B, 45-year-old male TB patient)

Day / Date	Anthropometry and Dietary Intake	Gastrointestinal Tolerance and ATD Adherence	Psychological Status (Anxiety)	Family Engagement and Self-Efficacy
Day 1 (May 8, 2026)	BW: 42.0 kg BMI: 16.1 kg/m² Intake: 5 tbsp/meal, 3x/day. Target: 2,400 kcal/day (high protein).	GI Status: Moderate gastric irritation and bloating post-ATD. Intervention: Moringa-Ginger tea introduced 2 h post-ATD. Tolerance: Well-tolerated; no adverse allergic reactions.	Score: 5/10 (Moderate). Symptoms: Worried about work incapacity and transmitting TB to family. Action: Psychoeducation on TB transmission and ATD mechanisms.	Caregiver: Wife (Ny. S). Baseline Knowledge: 55%. Role: Acted as primary treatment supporter (PMO) for medication adherence.
Day 3 (May 10, 2026)	BW: 42.03 kg Intake: 6 tbsp/meal, 3x/day + 1 afternoon snack. Subjective: Feeling more energetic.	GI Status: Gastric discomfort alleviated; appetite stimulated by ginger's gastroprotective effects. Tolerance: Tea consumed consistently without nausea.	Score: 3/10 (Mild). Symptoms: Engaged in light household planning. Action: Practiced deep breathing exercises independently.	Caregiver: Ny. S. Role: Successfully managed the critical 2-hour interval between ATD administration and tea consumption.

Day / Date	Anthropometry and Dietary Intake	Gastrointestinal Tolerance and ATD Adherence	Psychological Status (Anxiety)	Family Engagement and Self-Efficacy
Day 7 (May 14, 2026)	BW: 42.06 kg BMI: 16.2 kg/m² Intake: 4x/day consistently maintained.	GI Status: Complete resolution of ATD-induced dyspepsia. Physical: Noticeable improvement in physical stamina and mucosal hydration.	Score: 2/10 (Minimal). Symptoms: Optimistic, compliant, and focused on nutritional recovery.	Knowledge: 85%. Role: Independently prepared the composite tea and managed the daily nutritional schedule.