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The Differential Effect of Community-Based Supplementary Feeding on Wasting and Stunting: Epidemiological Evidence from an Endemic Region in West Nusa Tenggara

Imam Syahputra Yamin[1*], Santi Deliani Rahmawati[1], Baiq Repika Nurul Furqan[2]
[*1]STIKES Dharma Husada, Indonesia
[2]Universitas Nahdlatul Ulama Nusa Tenggara Barat, Indonesia
Alamat: Jl. Terusan Jakarta No.75, Cicaheum, Kec. Kiaracondong, Kota Bandung, Jawa Barat
Corresponding: imamyamin.epid@gmail.com

Abstract. Stunting remains a persistent public health challenge in Indonesia, particularly within high-prevalence enclaves. Although local food-based Supplementary Feeding Programs (SFP) are widely implemented, their specific epidemiological impact on anthropometric indices specifically the divergence between weight and height recovery requires rigorous evaluation in high-burden settings. This study aimed to analyze the effectiveness of a 90-day local food-based SFP intervention on anthropometric Z-score shifts among stunted toddlers in Setungkep Lingsar Village, East Lombok. A quasi-experimental study with a one-group pretest-posttest design was conducted on a total population of 59 stunted toddlers (aged 6–59 months). Anthropometric measurements (Weight, Height) and WHO standard indices (Weight-for-Age [WAZ], Height-for-Age [HAZ], and Weight-for-Height [WHZ]) were assessed pre- and post-intervention. Data were analyzed using the Paired Sample t-test with statistical significance set at $p<0.05$. The intervention yielded statistically significant improvements across all growth parameters ($p=0.0001$). The most rapid response was observed in acute nutritional indicators; the prevalence of normal nutritional status based on Weight-for-Height (WHZ) increased substantially from 10.2% to 46.9%, with a mean weight gain of 0.45 kg. Conversely, although Height-for-Age (HAZ) showed statistical improvement, the clinical shift from stunted to normal status remained minimal (2.0%), confirming a physiological lag in linear growth recovery compared to ponderal (weight) recovery. Local food-based SFP is highly effective for the rapid correction of acute malnutrition (wasting) but requires a sustained maintenance phase to achieve significant catch-up growth for stunting. Policy strategies in high-burden regions must extend monitoring beyond the acute recovery phase to ensure long-term linear growth rehabilitation.

Keywords: Stunting, Catch-up Growth, Local Food Intervention, Nutritional Epidemiology.

1. INTRODUCTION

Stunting constitutes a chronic manifestation of accumulated nutritional deficits and recurrent infections during the critical first 1,000 days of life (Vaivada et al., 2020). It is strongly associated with irreversible neurocognitive impairment, compromised immune capacity, and an elevated risk of degenerative metabolic diseases in adulthood (Victora et al., 2021). Globally, while prevalence trends indicate a decline, the velocity of this reduction remains insufficient to meet the 2030 Sustainable Development Goals (SDGs). Recent joint estimates by UNICEF, WHO, and the World Bank (2023–2024) indicate that approximately 22–23% of children under five worldwide remain stunted, with the heaviest burden concentrated in Asia and Africa (UNICEF/WHO/World Bank Group, 2023). The long-term implications are critical; stunting correlates directly with diminished educational attainment and economic productivity, thereby perpetuating intergenerational cycles of poverty (Galasso & Wagstaff, 2019).

In Indonesia, stunting reduction has been designated as an urgent national priority. Data from the 2023 Indonesian Health Survey (SKI) and the Indonesian Nutritional Status Study (SSGI) record a prevalence of 21.5% (Kemenkes RI, 2024). Although this figure represents a decrease compared to previous years, the rate of decline has decelerated and remains significantly distant from the ambitious 14% target set by the National Medium-Term Development Plan (RPJMN) for 2024. A primary challenge in the Indonesian context is pronounced regional disparity, several provinces continue to report prevalence rates exceeding 30%, suggesting the presence of region-specific contextual determinants that are not optimally addressed by generalized national programs (R. Titaley et al., 2019).

To address these nutritional deficits, specific intervention strategies are paramount, particularly through Supplementary Feeding Programs (SFP). Contemporary literature emphasizes a paradigm shift from manufactured supplementation to community-based local food approaches. Local food-based interventions are increasingly favored not only for providing essential macro- and micronutrients (animal protein, zinc, iron) but also for their superior sustainability, cultural acceptability, and potential to empower local economic resilience (Widaryanti et al., 2025). While the efficacy of local SFPs in facilitating catch-up growth has been documented across various developing nations, success is highly contingent upon compliance, nutrient density, and intervention duration (Leroy & Frongillo, 2019).

Despite the theoretical promise of community-based SFPs, empirical evidence regarding their short-term efficacy (e.g., 90-day protocols) in sociodemographically distinct Indonesian regions remains inconsistent. While some studies demonstrate significant improvements in nutritional status, others report stagnation attributed to confounding factors such as co-morbid infectious diseases and variation in parenting practices (Aini et al., 2023; Yamin et al., 2025). Furthermore, existing program evaluations frequently prioritize administrative coverage reporting over rigorous statistical analysis of anthropometric dynamics (WAZ, HAZ, WHZ) in high-burden areas (Heidkamp et al., 2021). This lack of granular, evaluative data hinders the formulation of precise, evidence-based nutritional policies at the regional level.

West Nusa Tenggara (NTB) stands as a priority province for stunting intervention due to its persistently high prevalence. Specifically, the catchment area of the Keruak Primary Healthcare Center faces severe challenges, with Setungkep Lingsar Village identified as a hyper-endemic cluster housing 59 stunted toddlers in 2024. The high incidence in this locale indicates a serious nutritional gap and underscores the urgency of ensuring that allocated SFP interventions deliver tangible physiological impacts. To date, no comprehensive study has

evaluated the clinical and anthropometric outcomes of the local SFP implemented in this specific setting.

While national programs often rely on manufactured biscuits, there is a paucity of evidence regarding the effectiveness of community-based Supplementary Feeding Programs (SFP) that utilize locally sourced ingredients, particularly in high-burden stunting enclaves like Setungkep Lingsar Village. Previous studies have focused largely on macro-level implementations, often overlooking the specific anthropometric shifts in localized, resource-limited settings utilizing indigenous food sources. Addressing this knowledge gap, this study aims to analyze the effectiveness of a community-based local food SFP on the nutritional status of stunted toddlers. Specifically, this research examines the differential shifts in body weight, height, and standardized anthropometric indices (z-scores) between the pre- and post-intervention phases. The findings are intended to provide not only an evaluative framework for local health authorities but also scientific evidence regarding the efficacy of local food utilization, offering a replicable model for regions sharing similar socio-demographic characteristics.

2. METHODS

This study employed a quantitative approach utilizing a quasi-experimental one-group pretest-posttest design to evaluate the impact of a community-based local food Supplementary Feeding Program (SFP). The research was conducted in Setungkep Lingsar Village, located within the catchment area of the Keruak Primary Healthcare Center, East Lombok Regency. The data evaluation period spanned from January to May 2025. Subject selection utilized a total sampling technique (census method), encompassing the entire population of stunted children aged 6–59 months who were recipients of the 2024 SFP intervention. Inclusion criteria required complete medical records for the intervention period. Based on these criteria, a total sample of 59 children was included in the analysis.

Data were collected via a rigorous retrospective review of secondary data derived from validated cohort registers and the electronic Community-Based Nutrition Recording and Reporting System (e-PPGBM) at Puskesmas Keruak. To ensure data integrity, a data cleaning process was conducted to identify and exclude incomplete records or extreme outliers based on WHO plausibility ranges. Measurement validity was ensured as the original data were collected by trained health personnel utilizing standardized anthropometric instruments. Data processing was performed using statistical software. Univariate analysis was conducted to describe the frequency distribution of respondent characteristics and baseline nutritional status.

The Shapiro-Wilk test was employed to assess the normality of the data distribution. To test the hypothesis, bivariate analysis was performed to evaluate the significance of the mean differences in growth indicators between pre-test and post-test measurements. A Paired Sample t-test was used for normally distributed data, while the Wilcoxon Signed-Rank Test was applied for non-normally distributed data. Statistical significance was established at $p < 0.05$.

3. RESULTS AND DISCUSSION

a. Distribution of Nutritional Status Among Stunted Children Before and After Local SFP Intervention

Statistical analysis revealed that the 90-day local food-based SFP elicited the most pronounced response in indicators of acute nutritional status (Weight-for-Height/WHZ). As presented in Table 1, a substantial increase was observed in the prevalence of children classified with Good Nutrition (Normal) status, rising markedly from 10.2% at baseline to 46.9% at endline.

These findings were corroborated by statistical testing (Table 2), which demonstrated a significant mean weight gain of 0.45 kg (p=0.0001). This rapid ponderal response indicates that the local SFP effectively addressed previously unmet daily energy and protein deficits (Mamun et al., 2023). Physiologically, body weight represents the parameter most sensitive to short-term fluctuations in nutritional intake compared to linear growth. This observation is consistent with the theory of catch-up growth, which posits that the physiological mechanism prioritizes the restoration of soft tissue mass (adipose and muscle tissue) before reallocating energy toward skeletal elongation (Myatt et al., 2018).

Table 1. Distribution of Nutritional Status Among Stunted Children Before and After Local SFP Intervention (n=59)

Indicator	Category	Pre-intervention		Post-intervention	
		N	%	n	%
Weight-for-Age (WAZ)	Severely Underweight	43	77.6	30	51.0
	Underweight	16	22.4	29	49.0
Height-for-Age (HAZ)	Severely Stunted	29	49.0	25	40.8
	Stunted	30	51.0	33	57.7
	Normal	0	0.0	1	2.0
Weight-for-Height (WHZ)	Wasted (Acute Malnutrition)	49	89.8	31	53.1
	Normal	10	10.2	28	46.9

In contrast to ponderal recovery (weight gain), improvements in linear growth indicators (HAZ) exhibited a slower trajectory, despite maintaining statistical significance

(p=0.0001). The mean height increased from 83.61 cm to 84.53 cm, representing a net gain of 0.92 cm. However, in terms of categorical status (Table 1), the clinical shift from Stunted to Normal remained minimal (2.0%). This phenomenon is well-documented in short-term interventions (< 6 months). The discrepancy between statistical significance manifested as a net height gain and the minimal clinical categorical shift suggests that the 90-day intervention functions primarily as a growth initiation phase. This duration is insufficient to fully correct chronic, cumulative linear deficits that have accrued over years (Bhutta et al., 2020; Elisanti et al., 2023).

Table 2. Comparison of Mean Anthropometric Measurements and Nutritional Indices Pre- and Post-Intervention (n=59)

Variable	Pre-intervention *(Mean)*	Post-intervention *(Mean)*	p-value
Weight (kg)	8.98	9.43	< 0.001
Height (cm)	83.61	84.53	< 0.001
Weight-for-Age (WAZ)	1.22	1.49	< 0.001
Height-for-Age (HAZ)	1.51	1.61	< 0.001
Weight-for-Height (WHZ)	2.10	2.47	< 0.001

The successful improvement in nutritional status observed in this study, particularly in Weight-for-Age (WAZ) and Weight-for-Height (WHZ) indices, can be attributed to the high nutrient density and bioavailability of the local food formulations employed. In contrast to studies utilizing manufactured biscuits which frequently induce flavor fatigue local food-based interventions (incorporating locally sourced animal proteins) tend to demonstrate superior organoleptic acceptability and a more complex micronutrient profile. Animal-source proteins provide essential amino acids that stimulate the secretion of Insulin-like Growth Factor 1 (IGF-1), a pivotal hormone regulating chondrogenesis in the epiphyseal growth plates and tissue synthesis (Semba et al., 2016). Our findings reinforce the argument that community-based solutions often outperform top-down approaches due to their cultural compatibility and ingredient availability (Midhet & Becker, 2010).

A critical point of discussion is the disparity between the rapid correction of wasting and the slower amelioration of stunting. Current literature identifies a temporal delay between ponderal (weight) recovery and subsequent linear (height) growth (Leroy et al., 2020). Children suffering from chronic malnutrition operate in a metabolic energy-conservation mode. When nutritional intake improves, the body prioritizes the restoration of energy reserves (adipose and muscle tissue) as a homeostatic survival mechanism. Only once ponderal sufficiency is achieved (normalized WHZ) is energy reallocated toward linear

skeletal elongation (Briend et al., 2015). Consequently, the substantial improvement in WHZ observed in our study (Table 1) serves as a positive early indicator that the children in Setungkep Lingsar Village are physiologically preparing for a phase of linear catch-up growth, provided the intervention is sustained (Onis & Branca, 2016).

These results offer measured optimism regarding the attainability of national stunting reduction targets. Although the prevalence remains high in the study locus, the positive growth velocity suggests that these targets are achievable through intensive, locally adapted approaches. The intervention model in Setungkep Lingsar could serve as a prototype for other regions in West Nusa Tenggara sharing similar sociodemographic characteristics. However, it must be acknowledged that specific nutritional interventions (such as SFP) contribute approximately 30% to stunting reduction efforts; the remaining 70% relies on sensitive interventions such as sanitation and clean water access which were not assessed in this study (Ruel & Alderman, 2013; Yamin et al., 2025).

The primary strength of this study lies in its generation of real-world evidence, reflecting the actual implementation of community-based interventions rather than the artificial conditions of a tightly controlled clinical trial. Our findings align with recent systematic reviews indicating that community-based nutritional interventions utilizing local resources significantly improve anthropometric outcomes in resource-limited settings (Ghodsi et al., 2021). Unlike centralized distribution of manufactured supplements (e.g., fortified biscuits), the utilization of indigenous food sources, such as those implemented in Setungkep Lingsar Village enhances maternal compliance and ensures cultural acceptability of the diet (Marlinton & Sulistyaningsih, 2024). A similar study in rural Indonesia also demonstrated that locally sourced protein interventions (e.g., snakehead fish) yielded superior weight gain compared to standard care due to higher bioavailability and palatability (Aini et al., 2023).

However, the interpretation of these findings must consider the inherent limitations of the quasi-experimental one-group pretest-posttest design. The absence of a control group precludes the definitive exclusion of confounding variables, such as seasonal variations in infectious disease morbidity or natural age-related maturation. Furthermore, the reliance on secondary data limited our ability to analyze other determinant variables, such as daily household nutrient intake and detailed history of infectious diseases. Future research should prioritize a Cluster Randomized Controlled Trial (cRCT) design with a minimum duration of six months to fully capture the longitudinal impact on linear growth recovery (Headey et al., 2018).

Despite these limitations, the implications of this study are profound for national stunting reduction strategies. First, the demonstrated efficacy of local food SFP suggests a necessary policy shift from generalized food aid (manufactured goods) to decentralized community kitchens. This approach not only improves nutritional status but also fosters economic circularity within the village by utilizing local market produce (Matare et al., 2021). Second, the intervention model highlights the critical role of maternal buffering where educational empowerment regarding local food processing enables mothers to sustain nutritional quality even after the program terminates. Consequently, local health authorities (Dinas Kesehatan) should integrate nutritional literacy modules into standard SFP guidelines to ensure long-term sustainability and prevent relapse into malnutrition (Rasnasuri et al., 2025).

4. CONCLUSION

This study provides empirical evidence substantiating the efficacy of community-based Supplementary Feeding Programs (SFP) utilizing local food sources as a vital intervention for ameliorating nutritional status in high-burden stunting enclaves, such as Setungkep Lingsar Village. The data confirms significant improvements in anthropometric indicators following the intervention, validating the shift towards localized nutritional solutions. However, to sustain these gains, it is recommended that future interventions integrate a strong educational component for caregivers and extend the intervention duration. Furthermore, policymakers should prioritize the allocation of resources to support community-led kitchens, ensuring that local food-based interventions are standardized and rigorously monitored for quality assurance.

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