JEKK

Rapid Response to Underweight: Effectiveness of a Short-Term Community-Based Intensive Nutritional Intervention

Filly Muharani[1], Sekar Elok Febriany[1], Santi Deliani Rahmawati[2], Imam Syahputra Yamin[2*], Yeni Mahwati[3]

[1]LKC Dompet Dhuafa, Jakarta, Indonesia
[2]Undergraduate Program in Public Health, STIKes Dharma Husada, Bandung, Indonesia
[3]Master of Program in Public Health, STIKes Dharma Husada, Bandung, Indonesia

ABSTRACT

Background: Childhood stunting and undernutrition remain critical global health challenges. While long-term interventions are common, the efficacy of short-term, community-based intensive nutritional interventions (Pos Gizi) requires further empirical evaluation.
Objective: This study aimed to analyze the clinical effectiveness of a 12-day intensive nutritional package on weight and height gain among underweight children under five in Garut District, West Java, using a quasi-experimental one-group pretest-posttest design.
Methods: The study included 69 children (aged 10–55 months) meeting the inclusion criteria, who received supplementary feeding and intensive health education over 12 days. Anthropometric data were collected at baseline and endline using standardized instruments. Data were analyzed using the Paired t-test and Cohen's d effect size calculation.
Results: Significant improvements were observed in both weight (p < 0.001) and height (p < 0.001) post-intervention. The mean weight gain was 0.20 kg (95% CI: 0.16–0.25), and the mean height gain was 0.65 cm (95% CI: 0.42–0.88). Effect size analysis indicated a large clinical impact on weight (d = 1.01) and a medium-to-large impact on height (d = 0.68).
Conclusion: Short-term intensive nutritional interventions are effective in stimulating rapid weight rehabilitation. While linear growth showed statistical improvement, this likely reflects acute physical recovery rather than permanent structural growth. This model is recommended as an initial acceleration strategy to manage undernutrition.

Keywords: Catch-up growth ; Nutritional intervention ; Community nutrition post ; Short-term intervention ; Weight rehabilitation.

Corresponding author, e-mail: imamyamin.epid@gmail.com

Introduction

Childhood malnutrition, particularly stunting and wasting, remains a persistent public health challenge in Indonesia.[1] Although national data from the 2024 Indonesian Nutritional Status Survey (SSGI) indicates a decline in stunting prevalence to 19.8%, this figure remains near the World Health Organization (WHO) public health significance threshold.[2] Regional disparities are acute, with Garut District recording volatile prevalence rates that consistently exceed the national average.[3]

The complexity of nutritional deficits in rural areas like Garut defies (one size fits all) solutions. Conventional interventions, such as the distribution of factory-manufactured biscuits, often fail to meet adherence targets due to low palatability and flavor fatigue among children.[4] Consequently, Community-Based Nutrition Interventions specifically the Positive Deviance/Hearth (Pos Gizi) model have emerged as a superior strategy. This approach utilizes affordable, locally sourced food and leverages the positive behavioral practices of mothers raising healthy children within the same resource-constrained environments.[5,6]

While the efficacy of long-term supplementary feeding programs (90 days) is well-documented[7], quantitative literature evaluating the impact of short-term intensive interventions (10–14 days) remains scarce. This brief window is critical as a rapid response phase to interrupt the trajectory from wasting to stunting. Recent evidence suggests that a 14-day local food-based intervention can yield significant weight gain; however, the mechanisms of catch-up growth within such a short duration require further validation across diverse demographic contexts. This brief window is critical as a rapid response phase to interrupt the trajectory from wasting to stunting.[8]

Beyond dietary intake, intervention success is modulated by environmental and behavioral determinants.[9] For instance, exposure to second-hand smoke is a critical confounder, increasing the risk of stunting by 13.49 times due to disrupted nutrient absorption.[10,11] Similarly, the active role of community health cadres in monitoring consumption compliance serves as a decisive variable in program outcomes.[12]

While these environmental and behavioral determinants contribute significantly to long-term growth failure, addressing these 'sensitive' factors requires substantial implementation time. Recent literature emphasizes that in acute conditions where a child has already experienced weight faltering, environmental interventions alone are insufficient to rapidly restore energy deficits.[1] The child's body, often operating in a catabolic state, requires aggressive, specific nutritional intake to interrupt the malnutrition cycle and counteract the effects of Environmental Enteric Dysfunction (EED) frequently associated with poor sanitation.[13,14] Consequently, an 'acceleration strategy' in the form of short-term intensive nutritional intervention is required to deliver immediate clinical impact while awaiting long-term environmental improvements.[5]

Recent evidence suggests that local food-based interventions yield higher compliance than manufactured supplements. However, the mechanisms of catch-up growth within such a short duration require further empirical validation. This study aimed to bridge this knowledge gap by evaluating the clinical effectiveness of a 12-day intensive nutritional package on accelerating the weight and height gain of underweight children in Garut District using a quasi-experimental one-group pretest-posttest design.

Methods

This study employed a quantitative approach utilizing a quasi-experimental one-group pretest–posttest design based on secondary data analysis. The dataset was derived from the routine monitoring and evaluation (M&E) records of the Pos Gizi (Community Nutrition Post) program, implemented by LKC Dompet Dhuafa in Garut Regency, West Java, throughout 2024. Anthropometric measurements recorded at baseline (pre-intervention) and endline (post-intervention) were utilized as the primary data points. Data extraction, cleaning, and

subsequent statistical analyses were conducted by the researchers between October and December 2025. The study population encompassed all children under five registered in the Pos Gizi program, and a total sampling technique was employed to include the entire cohort of beneficiaries in the analysis.

The inclusion criteria were defined as follows: (1) children actively enrolled in the LKC Dompet Dhuafa Pos Gizi program in 2024; (2) full compliance with the 12-day intervention protocol; and (3) availability of complete anthropometric records (weight and height) at baseline (Day 1) and endline (Day 12). Exclusion criteria encompassed participants who dropped out during program implementation and those with extreme outliers identified as data entry errors. From the initial cohort of 74 registered children, 5 were excluded from the analysis due to program non-completion or data anomalies. Consequently, the final analytical sample consisted of 69 children.

The intervention consisted of an Intensive Nutrition Package adapted from the Positive Deviance/Hearth (PD/Hearth) model. Over a period of 12 consecutive days, the children received a comprehensive intervention comprising three core components: (1) Rehabilitative Supplementary Feeding (PMT): A high-energy, high-protein meal plan utilizing locally sourced ingredients was prepared communally. The menus were designed based on accessibility and affordability for the local community, consisting of rice (carbohydrate source); animal and plant-based proteins (eggs, tofu, and tempeh); vegetables (spinach and carrots); and local fruits (bananas and papayas). Daily menu variations were implemented to ensure nutritional adequacy and enhance palatability and acceptance among the children. (2) Directly Observed Feeding: Trained community health cadres provided direct supervision during feeding sessions to ensure compliance with recommended portion sizes and intake. (3) Caregiver Education: Daily sessions focused on nutritional education and positive parenting practices were delivered to mothers or primary caregivers.

Cadre Training Prior to implementation, the participating health cadres underwent a specialized two-day training workshop organized by LKC Dompet Dhuafa. The training curriculum covered the fundamental principles of the PD/Hearth model, hygienic preparation of locally sourced supplementary foods, estimation of child portion sizes, and standardized techniques for monitoring and recording dietary intake. To minimize measurement bias given the short observation period, anthropometric data were collected by trained nutritionists using standardized instruments. Weight was measured using digital scales with 0.05 kg precision, and height using a microtoise with 0.1 cm precision. Measurements were consistently conducted in the morning to control for diurnal variation and ensure data reliability.

Data Analysis Data were processed using statistical software. Univariate analysis was performed to describe respondent characteristics. For bivariate analysis, the Paired Samples t-test was utilized to compare mean anthropometric measurements before and after the intervention. Additionally, Cohen's d was calculated to assess the effect size, providing a measure of the intervention's clinical significance beyond statistical probability.

Ethical Considerations This study was conducted as an independent evaluation of programmatic data belonging to LKC Dompet Dhuafa; the researchers were not involved in the design or implementation of the intervention. Authorization for data use was obtained from program administrators, and all data were analyzed anonymously to protect participant privacy. The study protocol received ethical approval from the Research Ethics Committee of STIKES Dharma Husada Bandung   (No. 007/KEPK/SDHB/B/XII/2025).

Result

A total of 69 children participated in this study. Univariate analysis indicated that the mean age of the participants was 29.67 months, with an age range of 10 to 55 months.

Table 1. Characteristics of Respondents

Variable	Mean ± SD	Range Min - Max
Age (months)	29.67	10 – 55
Baseline Weight (kg)	10.22 ± 1.92	6.00 - 15.00
Baseline Height (cm)	83.35 ± 8.94	62.00 - 105.00

As detailed in Table 1, the statistical analysis revealed highly significant changes following the intervention. At baseline (pre-intervention), the mean weight of the participants was 10.22 kg, and the mean height was 83.35 cm. These data establish the initial anthropometric status of the respondents prior to the administration of the intensive nutritional package.

Table 2. Analysis of Changes in Weight and Height Pre- and Post-12-Day Intervention

Variable	Baseline (Mean ± SD)	Endline (Mean ± SD)	Mean Difference (95% CI)	t-value	p-value
Weight (kg)	10.22 ± 1.92	10.42 ± 1.94	0.20 (0.16 - 0.25)	-8.427	0.001*
Height (cm)	83.35 ± 8.94	84.00 ± 8.95	0.65 (0.42 - 0.88)	-5.645	0.001*

*Note : CI = Confidence Interval. Statistical significance set at $p < 0.05$.

Table 2 presents the results of the inferential analysis using the paired samples t-test. The analysis revealed statistically significant improvements in both anthropometric indicators following the 12-day intervention ($p < 0.001$). Specifically, the mean weight increased from 10.22 kg to 10.42 kg, while the mean height rose from 83.35 cm to 84.00 cm. These findings demonstrate the effectiveness of the intensive nutritional package in stimulating growth among underweight children.

Regarding the weight indicator, a mean increase of 0.20 kg (200 g) was observed, rising from 10.22 kg at baseline to 10.42 kg post-intervention. The 95% Confidence Interval (CI) indicates that the estimated weight gain for this population ranges from 0.156 kg to 0.253 kg. The calculated t-value of -8.427 confirms that this difference is highly statistically significant and not attributable to chance.

Regarding height, a mean difference of 0.65 cm was recorded. It is important to note that while this difference is statistically significant (p=0.001), it represents an acute anthropometric change observed within the short intervention window.

Table 3. Estimation of Intervention Effect Size (Cohen's d)

Variable	Mean Gain	Percentage Increase (%)	Effect Size (Cohen's d)	Effect Magnitude
Weight	+0.20 kg	1.96 %	1.01	Large Effect
Height	+0.65 cm	0.78 %	0.68	Medium-to-Large Effect

To evaluate the clinical significance of these improvements beyond statistical probability, an analysis of the magnitude of effect (Cohen's d) is presented in Table 3. The program yielded a robust impact on weight, achieving a Cohen's d effect size of 1.01. This indicates that the 1.96% weight gain from baseline represents a large clinical effect, suggesting a rapid responsiveness of soft tissue to intensive caloric intake. Meanwhile, the height indicator exhibited an effect size of 0.68 (medium-to-large effect). Descriptively, these effect sizes demonstrate that the intervention successfully triggered a measurable shift in anthropometric status relative to the baseline distribution.

Discussion

This study provides compelling empirical evidence that short-term (12-day), community-based intensive nutritional interventions are effective in stimulating rapid improvements in the anthropometric status of underweight children. These findings challenge the conventional paradigm that nutritional rehabilitation necessitates prolonged durations, demonstrating instead that catch-up growth can be initiated immediately, provided that nutrient density and intervention adherence are rigorously maintained.

The primary finding of this study was a mean weight increment of 0.20 kg, with a calculated Cohen's d of 1.01, indicating a large effect size. From a clinical perspective, a weight gain of 200 grams over a 12-day period represents a rapid and substantial recovery trajectory for undernourished children. This finding aligns with previous evidence demonstrating that locally sourced supplementary feeding elicits a superior weight response compared to manufactured biscuits, primarily due to higher palatability and superior energy density.[8]

The physiological mechanism underlying these findings is the rapid repletion of glycogen stores and subcutaneous adipose tissue. In a state of undernutrition, the child's body functions in a catabolic mode. The high-protein and high-calorie intake provided by the Pos Gizi menu (incorporating nutrient-dense sources such as eggs, fish, and tempeh) stimulates the secretion of Insulin-like Growth Factor-1 (IGF-1), which plays a pivotal role in driving muscle protein synthesis and tissue growth.[15,16]

One particularly notable finding of this study is the significant increase in height (p < 0.001) accompanied by a medium-to-large effect size (d = 0.68). Theoretically, linear skeletal growth requires a more prolonged remodeling period compared to soft tissue accretion. However, the observed 0.65 cm gain within this short duration most likely reflects the improved hydration of intervertebral discs and postural correction resulting from restored physical vitality, in addition to the initial stimulation of the epiphyseal plate.[17] These findings corroborate previous research positing that specific nutritional interventions can exert a systemic impact on child growth when administered during critical developmental windows.[1]

The observed success of this program is intrinsically attributed to the adoption of the Positive Deviance/Hearth (PD/Hearth) methodology. In contrast to purely clinical interventions, this model cultivates social capital through participatory cooking demonstrations facilitated by health cadres. The active engagement of these community workers proved instrumental in enhancing maternal adherence to optimal feeding practices within the domestic setting.[12] Furthermore, the reliance on locally sourced ingredients from Garut enhances the program's sustainability by ensuring that raw materials are both readily accessible and affordable. This strategy directly mitigates cost-efficiency constraints, which frequently serve as a bottleneck in the implementation of national-scale initiatives.[18]

Notwithstanding the positive outcomes of the intervention, a critical analysis of underlying determinants remains essential. Recent literature highlights that the efficacy of nutritional interventions may be attenuated or blunted by adverse environmental conditions and parenting practices.[9] Other studies have identified a robust correlation between paternal smoking and stunting, wherein tobacco expenditure frequently displaces

household budget allocation for animal source foods.[19] Furthermore, poor environmental sanitation can precipitate environmental enteric dysfunction (EED), a state of chronic intestinal inflammation that impairs nutrient absorption even when dietary quality is adequate.[13,20] Consequently, the sustainability of the gains observed post-intervention is heavily contingent upon concurrent improvements in the child's domestic environment.[21,22]

The principal limitation of this study is the utilization of a one-group pretest-posttest design without a control group, which limits the ability to fully isolate the intervention effect from natural confounding factors. However, this design choice is ethicallyjustifiable; withholding immediate nutritional support from underweight children solely to establish a control group would be deemed unethical.[23] Conversely, the strength of this study lies in its rigorous daily monitoring protocol and the integration of Effect Size analysis a metric infrequently reported in comparable literature. This approach provides robust evidence regarding the true magnitude of the program's impact beyond simple statistical significance.

Based on these findings, this study strongly recommends the adoption of the 12-Day Pos Gizi model as a standardized rapid response protocol within Primary Health Centers (Puskesmas) and Community Integrated Health Posts (Posyandu). This strategy is critical for managing cases of weight faltering early, thereby preventing the progression to irreversible stunting. Furthermore, this community-based model offers a proven cost-effective alternative to resource intensive hospital-based therapeutic care.[24,25]

Conclusions

The 12-day intensive nutrition intervention demonstrated both statistical and clinical effectiveness in improving weight and linear growth among undernourished children in Garut Regency. Consequently, this intervention is strongly recommended for integration into primary healthcare services (Puskesmas and Posyandu) as a scalable model for Community-Based Nutritional Rehabilitation. Its viability is supported by three key advantages: the utilization of accessible locally sourced food resources, a concise implementation timeframe, and the demonstrated capacity to yield rapid impact on nutritional recovery. While promising, further research with controlled designs and longer follow-up periods is needed to assess the long-term sustainability of these gains and their ultimate impact on stunting reduction.

Acknowledgement

References

1. Vaivada T, Akseer N, Akseer S, Somaskandan A, Stefopulos M, Bhutta ZA. Stunting in childhood: an overview of global burden, trends, determinants, and drivers of decline. Am J Clin Nutr. 2020;112:777S-791S.
2. Kemenkes RI. Survei Status Gizi Indonesia (SSGI) 2024. 2025.
3. Pemda Kab Garut. Profil Daerah Kabupaten Garut 2024. Garut: Pemerintah Daerah Kabupaten Garut; 2025.
4. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in Indonesia. Maternal & Child Nutrition. 2018;14:e12617.

5. Sari NMW, Wangi MP, Ayuningtyas H, Himawati A, Handayani S, Sakinah FN, et al. Efektifitas Positive Deviance Hearth (Pos Gizi) untuk Perbaikan Anak Kurang Gizi di Perkotaan Surabaya, Indonesia: The Effectiveness of Positive Deviance Hearth (Pos Gizi) to Improve Malnourished Children in Urban Surabaya, Indonesia. Amerta Nutrition. 2023;7:449–58.

6. Wardhani LP, Putri NK. Implementasi Positive Deviance/Hearth sebagai Intervensi Gizi Guna Menurunkan Kekurangan Gizi pada Anak : Literature Review: Media Publikasi Promosi Kesehatan Indonesia (MPPKI). 2023;6:1760–7.

7. Putri ASR, Mahmudiono T. Efektivitas Pemberian Makanan Tambahan (PMT) Pemulihan Pada Status Gizi Balita di Wilayah Kerja Puskesmas Simomulyo, Surabaya. Amerta Nutrition. 2020;4:58–64.

8. Purbaningsih H, Syafiq A. Efektivitas Pemberian Makanan Tambahan (PMT) Berbahan Pangan Lokal Terhadap Kenaikan Berat Badan Balita. MPPKI (Media Publikasi Promosi Kesehatan Indonesia): The Indonesian Journal of Health Promotion. 2023;6:2550–4.

9. Yamin IS, Sulistiawati F, Hardianti M. The Relationship Between Gadget Usage Habits, Parenting Stayles And Eating Patterns Of Children Aged 4-7 Years With The Nutritional Status. Professional Health Journal. 2025;6:492–8.

10. Janggu J, Dadut R, Manggul M, Halu S, Dafiq N, Banul M, et al. Parental Smoking Behavior With Stunting Incidents in East Nusa Tenggara, Indonesia. In: Proceedings of the 2nd International Conference on Education, Humanities, Health and Agriculture, ICEHHA 2022, 21-22 October 2022, Ruteng, Flores, Indonesia [Internet]. Ruteng, Indonesia: EAI; 2023 [cited 2025 Dec 12]. Available from: http://eudl.eu/doi/10.4108/eai.21-10-2022.2329708

11. Weiha RO, Solikhah LS, Hardianti H. Hubungan Perilaku Merokok dan Keterlibatan Ayah Dengan Stunting pada Balita. Media Gizi Ilmiah Indonesia. 2025;3:143–52.

12. Zuhra A, Adriati D, Hazrah A, Hidayat K, Sari MN. Peran Kader Posyandu di Desa Ara Condong dapat Mempengaruhi Masyarakat dalam Pencegahan Stunting pada Anak. MODELING: Jurnal Program Studi PGMI. 2023;10:155–65.

13. Mertens A, Arnold BF, Benjamin-Chung J, Boehm AB, Brown J, Capone D, et al. Effects of water, sanitation, and hygiene interventions on detection of enteropathogens and host-specific faecal markers in the environment: a systematic review and individual participant data meta-analysis. The Lancet Planetary Health. 2023;7:e197–208.

14. Fithra H, Siska D. The Correlation between Environmental Sanitation and Stunting Case in Pidie District. International Journal on Advanced Science, Engineering and Information Technology. 2020;10:1214–20.

15. Gat-Yablonski G, Phillip M. Nutritionally-Induced Catch-Up Growth. Nutrients. 2015;7:517–51.

16. Golden MH. Evolution of nutritional management of acute malnutrition. Indian Pediatr. 2010;47:667–78.

17. Brinkman JE, Tariq MA, Leavitt L, Sharma S. Physiology, Growth Hormone. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Dec 12]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK482141/

18. Amalia R, Siregar FR, Alfian MF, Arie Sandy LP. Regulations on nutrition in Indonesia and its relation to early childhood caries. Front Public Health [Internet]. 2022 [cited 2025 Dec 12];10. Available from: https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.984668/full

19. Muchlis N, Yusuf RA, Rusydi AR, Mahmud NU, Hikmah N, Qanitha A, et al. Cigarette Smoke Exposure and Stunting Among Under-five Children in Rural and Poor Families in Indonesia. Environ

Health   Insights. 2023;17:11786302231185210.

20. Agustiani R, Meliyana E. Hubungan Sanitasi Lingkungan dengan Kejadian Stunting. Jurnal Penelitian Perawat Profesional. 2024;6:1669–78.

21. Marshak A, Young H, Radday A, Naumova EN. Sustained nutrition impact of a multisectoral intervention program two years after completion. Matern Child Nutr. 2020;17:e13103.

22. Syafriani S, Haryati H, Fitri RP, Afiah A. The Influence of Socio-Economic and Environmental Factors on the Nutritional Status of Toddlers in Urban and Rural Areas in Bangkinang Regency, Riau, Indonesia. Journal of Health and Nutrition Research. 2025;4:152–61.

23. World Medical Association. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. JAMA. 2013;310:2191–4.

24. Syitra SMLP, Tiara A, Tarigan AA. Effectiveness of Community-Based Nutrition Interventions in Preventing Stunting and Malnutrition in Toddlers: A Literature Review. International Journal Of Health Science. 2025;5:78–88.

25. World Bank. Spending Better To Reduce Stunting In Indonesia [Internet]. 2020. Available   from: https://hdl.handle.net/10986/34196