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Empowering Community Health Volunteers: Enhancing Early Stunting Detection through Knowledge and Skill Development in Indonesia's 3T Regions

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ABSTRACT: Stunting remains a persistent public health issue in Indonesia, particularly in rural and 3T (Terdepan, Terluar, Tertinggal) regions. Posyandu cadres, as community health volunteers, are positioned to play a pivotal role in the early detection of stunting. This study examines how knowledge and skill development interventions improve cadres' capacity for early stunting detection. Using a qualitative descriptive design, this study synthesizes findings from eight empirical studies and relevant national data. Thematic analysis was applied to examine the effects of training programs on cadre knowledge acquisition, skill proficiency, and community health outcomes. The research further assesses frameworks appropriate for analog 3T contexts, including logistical, cultural, and policy considerations. Key results demonstrate a statistically significant improvement in cadre knowledge following training interventions, with a strong correlation (r = 0.80) between knowledge gains and improved stunting detection skills. Enhanced competencies led to reductions in community stunting cases, improved parental health behaviors, and greater community engagement. Barriers such as geographic isolation and cultural resistance were identified, underscoring the need for tailored training and ongoing supervision. The findings emphasize the importance of institutionalizing sustainable training models, supported by cross-sectoral policy frameworks. Posyandu cadres, when properly trained and supported, serve as critical agents in Indonesia's mission to reduce childhood stunting. Community-integrated, scalable interventions are essential to extend this impact across underserved regions.

Keywords: Stunting, Posyandu Cadres, Community Health Volunteers, Knowledge Training, Rural Health, Early Detection, Indonesia.

INTRODUCTION

Stunting continues to pose a critical public health challenge in Indonesia, characterized by persistent disparities between urban and rural regions. Despite government-led interventions and nutritional campaigns, the national prevalence remains alarmingly high. As of 2022, the stunting rate among

children aged 24–59 months was estimated at 21.6%, showing only a marginal decline from 24.4% in 2021 (Wiliyanarti et al., 2024; Beal et al., 2018). This decline, although statistically meaningful, still situates Indonesia among Southeast Asia's highest in child stunting rates (Novita et al., 2024; Wiliyanarti et al., 2024). The situation is particularly severe in regions classified as 3T (*Terdepan, Terluar, dan Tertinggal* frontier, outermost, and underdeveloped), such as East Nusa Tenggara, where the convergence of poverty, limited healthcare access, and poor sanitation infrastructures exacerbates the stunting burden (Indra & Khoirunurrofik, 2022).

Within this landscape of health inequity, community-based interventions have emerged as pivotal in closing the gap. The Posyandu system, one of Indonesia's key community health mechanisms, has played a central role in promoting child health and nutritional monitoring. Posyandu cadres, who are local health volunteers, form the backbone of this system. They are trained by primary healthcare authorities to provide regular maternal and child health services, including immunization, health education, and growth monitoring (Iswarawanti et al., 2019; Qodir et al., 2024). These cadres also engage households in nutrition counseling and hygiene promotion activities, which are vital in the prevention of growth faltering (Rahmayanti et al., 2022; Tampake et al., 2022).

The effectiveness of these cadres is, however, contingent upon their knowledge and skills. Studies consistently highlight that well-informed cadres demonstrate higher efficacy in identifying early signs of stunting and mobilizing timely responses. Their active and competent participation in community health promotion has been linked to increased maternal awareness and better child-feeding practices (Ahmad et al., 2023; Bastian et al., 2023). Nevertheless, significant barriers persist, particularly in remote and underserved areas. These include inconsistent training coverage, inadequate resources, and sociocultural factors that limit the assimilation of health messages.

Rural and 3T regions often experience overlapping deprivations: low educational attainment, entrenched poverty, and entrenched traditional beliefs regarding nutrition and health-seeking behaviors (Beal et al., 2018; Suratri et al., 2023). Furthermore, environmental constraints such as unreliable water supply, inadequate sanitation, and food insecurity create systemic obstacles to child growth and development (Wiliyanarti et al., 2024; Indra & Khoirunurrofik, 2022). These structural inequities hamper not only children's well-being but also the operational capacity of Posyandu cadres, who are often required to function without sufficient institutional support.

Globally, health systems have adopted various training models aimed at equipping community health workers (CHWs) to address stunting and malnutrition. Indonesia's Care for Child Development (CCD) program exemplifies efforts to contextualize cadre training in accordance with local cultural norms and field realities (Akhmadi et al., 2021; Rahmayanti et al., 2022). Other nations, including South Africa and Zambia, have implemented CHW models that prioritize structured and continuous training, supported by supervision and community integration (Keller et al., 2017; Mambulu-Chikankheni et al., 2018). These models emphasize experiential learning, participatory counseling, and locally relevant education strategies principles that have shown significant promise in boosting CHW performance (Pardosi et al., 2024; Setyoadi et al., 2023).

Empirical evidence underscores the value of cadre empowerment in advancing child health outcomes. In both Indonesia and similar low-resource contexts, increased training and community engagement have been linked to reductions in stunting prevalence and improved care-seeking behaviors. Several studies report that empowered cadres with strong community trust and technical capacity are more effective in early growth monitoring and parental guidance (Akhmadi et al., 2021; Siregar et al., 2020). Such empowerment strategies not only elevate the status of cadres as agents of change but also facilitate the flow of evidence-based health practices into communities.

Nationally, Indonesia has recognized the strategic importance of Posyandu cadres in addressing stunting. Government policies have prioritized cadre training and village-level investments in health infrastructure. The allocation of village funds for health activities, including cadre development, has enabled broader coverage of community-based interventions (Indra & Khoirunurrofik, 2022; Siregar et al., 2020). Furthermore, intersectoral programs linking health, education, and sanitation have emphasized the need for coordinated efforts to prevent child malnutrition. Despite these institutional advancements, gaps remain in implementation quality, monitoring mechanisms, and sustainability planning (Setyoadi et al., 2023; Rahmayanti et al., 2022).

Taken together, these findings reflect the multifaceted nature of stunting prevention in Indonesia. Effective interventions require a combination of contextually grounded training, operational resources, and policy support. The persistent challenge is how to translate these into practical outcomes in regions with entrenched underdevelopment and logistical barriers.

This study aims to examine the relationship between knowledge and skill development among Posyandu cadres and their capacity to detect stunting early. The research draws from a synthesis of empirical evidence and policy reviews, focusing on the implementation of cadre empowerment strategies in rural or 3T-like regions. In doing so, it seeks to identify how knowledge acquisition translates into improved field performance and whether these outcomes are sustainable under current institutional frameworks. The novelty of this study lies in its contextual interpretation of existing data and its emphasis on local adaptations of cadre training.

Through this lens, the paper will argue that empowering community health cadres is not only an effective approach to reducing stunting but also a viable strategy for strengthening grassroots health systems in Indonesia. The capacity to detect stunting early hinges on technical competence, community integration, and policy alignment factors that must be addressed simultaneously to achieve sustainable progress.

METHOD

This study adopts a qualitative descriptive design aimed at synthesizing empirical evidence regarding the impact of knowledge and skill development interventions on the performance of Posyandu cadres in early stunting detection. The qualitative approach is particularly suitable for this research, as it

facilitates the exploration of complex, context-bound phenomena such as volunteer empowerment and behavioral change within community health structures. It allows for a nuanced understanding of how training interventions affect cadres' capacity to operate in low-resource, often rural or 3T-like, environments.

In evaluating the effectiveness of cadre training, two established qualitative frameworks guided the study design. First, the Capacity Building Framework was utilized to assess the development of individual capabilities among cadres, including their knowledge acquisition, skill application, and contextual adaptation (Dolovich et al., 2020). This framework also considers environmental enablers and barriers, such as community infrastructure and support systems.

Second, the Stakeholder Engagement Framework was applied to examine how Posyandu cadres interact with key community actors including families, village leaders, and healthcare professionals. This lens helps assess the relational dynamics that underpin successful health promotion and early detection interventions (Agarwal et al., 2019). These frameworks were selected for their emphasis on real-world complexity, and their ability to capture volunteer experiences holistically.

The study synthesizes findings from eight empirical sources: peer-reviewed articles, program evaluations, and government reports. These were selected based on their relevance to cadre training, early stunting detection, and rural implementation. Inclusion criteria included: (1) interventions targeting Posyandu cadres; (2) availability of pre/post intervention results; and (3) regional relevance to 3T-like settings in Indonesia. Studies without empirical findings or lacking focus on stunting were excluded.

To synthesize these diverse data sources, thematic analysis was employed. This method involves identifying, analyzing, and reporting recurring patterns or themes within qualitative data (Hill et al., 2021). Thematic analysis enabled a structured interpretation of complex narratives, allowing for cross-study comparisons while preserving contextual richness. Themes emerged around four focal areas: training implementation, knowledge outcomes, skill improvements, and community-level health impacts.

The process followed Braun and Clarke's six-phase guide: (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the final report. Studies were coded using NVivo software to ensure consistency, and results were validated through peer debriefing and triangulation with policy documents.

Because not all included studies were conducted explicitly in 3T areas, a framework for analog classification was developed. Analogous regions were identified based on three core characteristics: (1) socioeconomic indicators such as high poverty rates and low education attainment; (2) geographic isolation marked by difficult terrain and limited transportation infrastructure; and (3) health disparities, particularly high prevalence of stunting and maternal-child malnutrition (Wiliyanarti et al., 2024).

Cultural dimensions were also considered, including local beliefs about health, food taboos, and healthcare-seeking behaviors (Kamau, 2020). These criteria allowed for the inclusion of relevant case studies from areas not officially designated as 3T but sharing comparable challenges.

As a secondary data synthesis, this study did not require ethical approval for human subjects research. However, all original sources adhered to ethical standards in their respective designs, including informed consent and data confidentiality. Proper citation and acknowledgment of original work were maintained throughout.

The primary limitation of this study is its reliance on secondary data, which may introduce variability in measurement tools and outcome definitions. Additionally, while analog criteria were rigorously defined, the absence of direct field data from designated 3T regions may affect generalizability. Nevertheless, thematic saturation and cross-validation enhance the credibility of findings.

To ensure validity, the study employed source triangulation drawing on multiple types of evidence and theory triangulation via diverse conceptual frameworks. Coding consistency was checked through inter-coder reliability testing. The process was documented transparently, and data interpretations were validated against current literature and health policy frameworks.

This methodology enables a comprehensive understanding of how knowledge and skill development influences Posyandu cadres' performance in early stunting detection. The chosen frameworks and analytical strategies support the study's objective to offer contextually relevant insights for policy and practice.

RESULT AND DISCUSSION

This chapter presents the key findings derived from a qualitative synthesis of eight empirical studies and relevant literature on Posyandu cadre empowerment in early stunting detection. The analysis is structured into three major themes: training and knowledge gains, the correlation between knowledge and skill, and community-level impacts. The results are supported by the inclusion of relevant literature statements and empirical evidence.

Training and Knowledge Gains

As this study synthesizes existing literature, the pre-test/post-test results were drawn from reviewed studies rather than primary data. Such evaluation models have proven to be highly effective in measuring knowledge improvements among community health volunteers (CHVs). These methods provide quantifiable data on the extent of learning acquired through training interventions. For instance, in the Program "Kader Pintar," cadre knowledge levels rose from 66.7% to 100%, and in another case, from 24% to 94% (Prabandari et al., 2022).

These results were corroborated by paired samples t-tests, which revealed statistically significant improvements in knowledge retention, reinforcing the efficacy of training initiatives (Yani et al., 2023).

The areas of knowledge that cadres are expected to master include understanding child growth standards, anthropometric assessment techniques (weight, height), basic nutritional needs, and socio-economic determinants of health (Farokah et al., 2023). This knowledge base equips them to perform accurate risk identification and initiate responsive community-level actions (Indrayani, 2023).

Instructional methods that emphasize participatory learning such as role-play, group discussions, and simulations were particularly effective in enhancing knowledge retention (Surjaningrum et al., 2022). Combining theoretical instruction with practical exercises, like field measurements of child growth metrics, further solidified cadre competence (Djuari et al., 2023; Siswati et al., 2022).

Table 1: Summary of Training Interventions and Knowledge Gains

Study Location	No. of Cadres	Pre-test Score	Post-test Score	Improvement (%)
Edukasi Kader, Ahmar Educ. J.	50	24%	94%	+70%
Program "Kader Pintar"	15	66.7%	100%	+33.3%

To ensure consistency and comparability, standardized tools such as the Knowledge, Attitude, and Practice (KAP) survey are often used to assess cadre knowledge improvements. These instruments provide a reliable basis for evaluating knowledge acquisition across different intervention programs (Nkonki et al., 2017).

Knowledge–Skill Correlation

Skill proficiency, especially in anthropometric measurements, is typically assessed through practical demonstrations and observation. Cadres are evaluated on their ability to accurately measure children's height and weight using standard equipment and compare results against national growth charts (Yani et al., 2023). Inter-rater reliability measures ensure the accuracy and consistency of assessments (Armini, 2020).

Statistically, a strong positive correlation ($r = 0.80$, $p < 0.05$) was observed between knowledge acquisition and improved detection skill, validating the theory that increased knowledge translates to higher functional capacity (Muharni, 2018).

However, studies have shown that these knowledge–skill gains may decline over time without reinforcement. Regular feedback sessions, refresher training, and mentorship from senior health staff are critical in sustaining skill proficiency (Schleiff et al., 2021). Involvement from local health

authorities in on-the-job training also increases cadre motivation and retention (Trisfayeti & Idris, 2023).

External factors such as socio-economic barriers, community acceptance, and the availability of essential resources can significantly influence how well cadres apply their knowledge in real-world settings (Suarayasa et al., 2024; Tyarini et al., 2024).

Community-Level Impacts

Community health indicators provide critical insight into the real-world impact of cadre-led interventions. Common indicators include rates of child malnutrition, attendance at health posts, and improvements in maternal knowledge of child feeding practices (Armini, 2020; Suarayasa et al., 2024).

Cadres influence parental behavior through structured outreach such as home visits, nutrition demonstrations, and counseling sessions. These activities have led to measurable changes in breastfeeding practices, complementary feeding, and hygiene behaviors (Ekowati et al., 2016).

Table 2: Community Outcomes Before and After Cadre Empowerment

Village	Initial Stunting Cases	Final Stunting Cases	Reduction	Notes
Jenarsari	26	21	-5	No control group, direct impact noted
Lampung Tengah	Not specified	Not specified	n/a	Improved detection skills observed

Empirical data supports the claim that cadre empowerment contributes to reductions in stunting. Similar reductions ranging from 10% to 20% have been recorded in systematic reviews of grassroots health interventions (Siswati et al., 2022).

Communities consistently regard Posyandu cadres as credible and trustworthy sources of health information. Their integration into the community and close relationships with families enhance the uptake of health practices (Rinawan et al., 2021).

These findings highlight the multi-dimensional impact of knowledge and skill development programs for Posyandu cadres not only in strengthening individual competencies but also in producing measurable improvements in community health outcomes.

The findings of this study confirm that structured knowledge and skill development interventions for Posyandu cadres can significantly enhance their capacity to detect stunting early, particularly in underserved areas. However, the successful implementation and sustainability of such interventions

require consideration of logistical, cultural, institutional, and strategic dimensions especially in the context of Indonesia's 3T (*Terdepan, Terluar, Tertinggal*) regions.

One of the most pronounced challenges faced by cadres in 3T regions is logistical. Inadequate transportation infrastructure impairs their ability to access remote communities, limiting the frequency and consistency of their monitoring activities (Santoso & Rodiyah, 2024). The scarcity of essential supplies such as anthropometric tools, educational booklets, and data recording systems further constrains their operational effectiveness (Muslimin & Mursyidah, 2024; Nasution et al., 2022). In addition, cadres often function in isolation, lacking both technical supervision and peer support, which can diminish morale and long-term retention.

Cultural barriers also play a critical role. In many remote areas, traditional beliefs about health, nutrition, and child-rearing can lead to skepticism about the information delivered by cadres (Ardianingsih et al., 2024). Resistance to change, especially when it contradicts deeply held practices, often hinders the adoption of evidence-based recommendations. This is compounded by low literacy and health education levels among caregivers, which makes health promotion communication more challenging (Nasution et al., 2022).

To overcome these challenges, sustainable training and supervision models are essential. The mentorship model has shown promise, pairing experienced health professionals with new cadres to ensure continuity of knowledge transfer and emotional support (Wasono & Sukmana, 2024). This relational approach not only builds technical competence but also fosters cadre confidence and commitment. Integrated training programs that blend theory with practice, particularly on stunting prevention and child nutrition, have also proven effective in enhancing relevance and adaptability (Rospiati et al., 2023). Flexible training schedules that accommodate local socio-economic conditions increase participation and reduce dropout rates (Megawati & Daiyah, 2024).

Digital platforms offer additional scalability. Mobile-based learning applications and remote mentoring tools provide cadres with continuous access to up-to-date health information and guidelines (Sinaga, 2023). These innovations are especially valuable in geographically isolated settings where in-person training is infrequent.

The role of national policy in supporting cadre empowerment cannot be overstated. Policies that allocate resources toward training infrastructure, digital tools, and incentive structures enhance cadre motivation and performance. Coordination between the Ministry of Health, local governments, and other sectors is vital to avoid fragmentation and ensure program coherence (Rokhmah et al., 2024; Selvia et al., 2024). This coordination strengthens multi-sectoral implementation and accountability. The establishment of standard training protocols across regions ensures consistency in the quality of services provided (Lusiana, 2024; Sari, 2021).

Moreover, incentive schemes whether monetary or non-monetary serve as powerful tools for improving cadre retention. Recognizing and rewarding cadres' contributions fosters a sense of value and accountability (Megawati & Daiyah, 2024). Inter-sectoral collaboration further strengthens the

impact of cadre programs. When education, health, and social sectors work in tandem, the support network for cadres is expanded, and their work is more integrated within the broader community development agenda (Mardiansyah, 2022

Best practices for scaling community health volunteer programs include fostering genuine community engagement. This means involving local leaders and community members from the design phase, which increases ownership and program relevance (Sanjaya et al., 2022). Partnering with local NGOs and civil society organizations adds an additional layer of sustainability and contextual insight (Selvia et al., 2024). Technological integration, such as mobile applications that offer stunting detection tutorials, enhances cadre efficiency (Mulyani et al., 2024).

Incorporating data-driven approaches is also crucial. Regular monitoring and evaluation help adapt programs to local needs, improve implementation fidelity, and ensure accountability (Gemiharto et al., 2024; Masdiputri et al., 2024). Establishing clear feedback mechanisms enables cadres to refine their practice, contributing to continual program improvement.

In summary, while Posyandu cadres are well-positioned to play a transformative role in early stunting detection, especially in low-resource settings, their effectiveness is closely tied to the broader systems in which they operate. Addressing logistical and cultural barriers, ensuring sustainable training and supervision, providing robust policy support, and following best practices for program scale-up are all essential components. These considerations must be addressed holistically to ensure the long-term success and scalability of cadre empowerment programs in Indonesia and similar settings.

CONCLUSION

This study has examined the relationship between knowledge and skill development among Posyandu cadres and their capacity to detect stunting early, with particular attention to underserved and 3T (Terdepan, Terluar, Tertinggal) regions in Indonesia. Drawing from a synthesis of eight empirical studies, literature reviews, and policy analyses, the findings underscore the transformative potential of structured training and empowerment models for improving community health outcomes.

Key findings indicate that training interventions significantly enhance cadre knowledge and directly correlate with improved stunting detection skills. Notably, cadres who received structured, interactive training showed measurable gains in knowledge retention and field application, as evidenced by both statistical and observational data. These improvements extended beyond individual competencies to affect broader community-level outcomes, including reductions in stunting rates and enhanced parental health behaviors.

However, challenges remain, especially in the context of Indonesia's 3T regions. Logistical barriers, such as inadequate infrastructure and resource limitations, hinder effective service delivery. Cultural obstacles including local beliefs and low literacy further complicate health education efforts. To overcome these constraints, sustainable training models that integrate mentorship, practical modules,

and digital tools are essential. Moreover, supportive national policies that align health, education, and infrastructure initiatives can significantly amplify the impact of cadre programs.

Importantly, the study highlights that Posyandu cadres function not only as service providers but also as agents of change within their communities. Their close ties to local populations uniquely position them to identify early health risks and facilitate timely interventions. Strengthening their capacity through systematic, ongoing support is therefore crucial.

In sum, empowering Posyandu cadres with contextually appropriate knowledge and skills is a vital strategy in Indonesia's broader efforts to combat stunting. When properly trained and supported, cadres can drive meaningful improvements in child health at the grassroots level. Future initiatives should prioritize integrated, community-responsive approaches that ensure cadres remain effective, motivated, and equipped to meet evolving public health challenges. This statement underscores the crucial role of cadre empowerment in sustaining Indonesia's long-term stunting reduction efforts.

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