Journal of Health and Nutrition Research
Vol. 5, No. 1, 2026, pg. 401-414, https://doi.org/10.56303/jhnresearch.v5i1.1087
Journal homepage: https://journalmpci.com/index.php/jhnr/index

e-ISSN: **2829-9760**

Strengthening Nutrition Interventions through Academic Collaboration in Pasaman Barat, Indonesia

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ORIGINAL ARTICLES

Submitted: 20 November 2026

Accepted: 6 January 2026

Keywords:
Stunting, Academic Collaboration, Community, Nutrition

ABSTRACT

This study aims to strengthen evidence-based policymaking for stunting reduction in Pasaman Barat District, Indonesia, through a collaborative model linking academic institutions with the local government. A situation analysis was conducted to assess program coverage, implementation challenges, and multisectoral support related to stunting prevention. Quantitative data from 20 primary health centers showed that most specific nutrition intervention indicators were below the national minimum target of 80%. A pilot strengthening program was then implemented to improve cadre capacity, service supervision, community engagement, and data management. Post-intervention results demonstrated statistically significant improvements in growth monitoring (54.49%±27.19 to 97.43%±5.26; p = 0.00), exclusive breastfeeding (19.04%±28.47 to 59.28%±37.38; p = 0.00), and iron–folic acid supplementation among pregnant women (22.28%±16.96 to 85.28%±24.62; p = 0.00). Other indicators, including complementary feeding practices, antenatal care visits, and adolescent anemia screening, showed numerical but non-significant changes. Qualitative findings further revealed challenges related to limited cadre skills, inadequate facilities, insufficient intersectoral coordination, low community participation, and inconsistent data quality. The developed collaboration model facilitated closer integration of research evidence into local decision-making and supported the formulation of strategic policy recommendations.

Key Messages:
A structured and institutionalized academic–government collaboration model significantly strengthens the implementation of specific nutrition interventions and enhances evidence-based policymaking, providing a scalable framework for accelerating sustainable stunting reduction in high-burden rural regions

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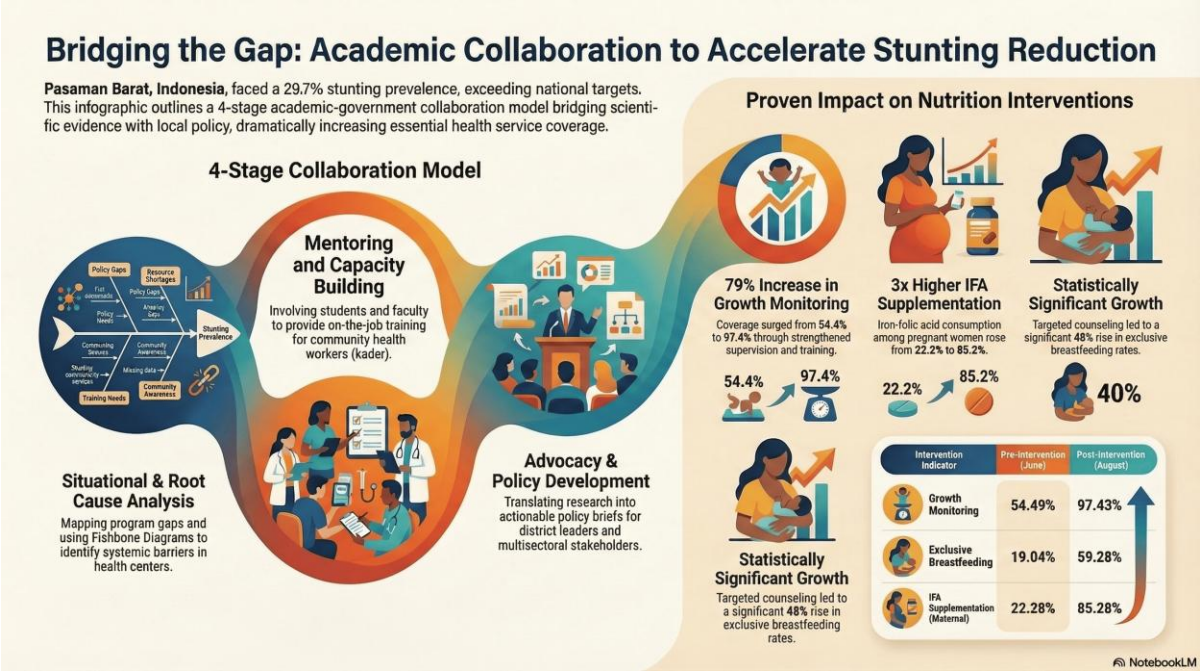
GRAPHICAL ABSTRACT



INTRODUCTION

Stunting, defined as impaired linear growth caused by chronic undernutrition, remains one of the major public health challenges in Indonesia.(1) According to the 2024 Indonesia Nutritional Status Survey (SSGI), the national stunting prevalence decreased to 19,8%, marking progress but still exceeding the 20% threshold set by the World Health Organization (WHO).(2,3) At the regional level, the situation is even more concerning. In Pasaman Barat District, West Sumatra Province, the stunting prevalence in 2023 was recorded at 29.7%, far above both the provincial and national averages.(2) Such a high stunting rate poses long-term risks to cognitive development, educational achievement, human resource quality, and future economic productivity.(4,5)

Various efforts have been undertaken by the government, both through specific nutrition interventions—such as maternal and child health services, nutrition supplementation, and child growth monitoring—and sensitive nutrition interventions, including adequate sanitation, access to clean water, and poverty alleviation.(6) However, many health programs at the local level have not been implemented optimally due to limited human resources, insufficient cross-sector coordination, and insufficient use of scientific data in program planning, implementation, and evaluation. As a result, policies produced are often generic, not grounded in local evidence, and do not fully consider socio-economic contexts or on-the-ground implementation challenges.

The urgency of reducing stunting has grown even stronger as the Indonesian government targets lowering the prevalence to 14% by 2024.(7) Achieving this target requires policies that are effective, adaptive, and evidence-based, taking into account the specific conditions of each region. In this context, universities play a strategic role in providing data analysis, scientific assessments, technical assistance, and evidence-based policy recommendations to support local governments.(8) Collaboration between academics and local governments is expected to bridge the gap between scientific evidence and public policy, enabling the development of more targeted, comprehensive, and sustainable stunting-reduction strategies.(9,10)

Most studies on stunting reduction in Indonesia still focus on the effectiveness of nutritional interventions or their determinants, while models of academic–government collaboration in developing evidence-based policy at the district level have not been widely explored or documented.(11) Yet such collaboration is essential to ensure that local policies are truly aligned with local contexts, grounded in scientific data, and sustainable.

https://doi.org/10.56303/jhnresearch.v5i1.1087

Previous academic–government collaborations in Indonesia have often been limited in effectiveness due to several factors. Many initiatives were short-term, lacked structured coordination, or were not fully integrated into local policymaking processes, resulting in research findings that were underutilized in program planning and decision-making.(12) Moreover, these collaborations frequently focused on isolated interventions rather than a comprehensive, multisectoral approach, limiting their ability to address the complex and interrelated determinants of stunting. Pasaman Barat District faces additional challenges that exacerbate stunting rates, including high rates of poverty, limited access to nutrient-dense foods, geographic barriers that restrict access to health primmary care, and persistent gaps in maternal knowledge regarding optimal feeding practices

This study aims to develop an academic-local government collaboration model for evidence-based policy development in Pasaman Barat Districy by integrating an analysis of stunting determinants, an assessment of program implementation gaps, and technical assistance in policy formulation, thereby generating strategic recommendations and providing a potential best practice example for iother regions in Indonesia. By integrating an analysis of stunting determinants, evaluation of existing program effectiveness, and technical assistance in policy formulation, this study seeks to contribute both scientifically and practically to the acceleration of stunting reduction nationwide. The research aims to develop a collaborative model between academic institutions and local government in evidence-based policy development, and to formulate strategic recommendations that support stunting-reduction policymaking in Pasaman Barat District, Indonesia.

METHODS

This study was conducted from June to September 2025 in Pasaman Barat District, West Sumatra Province, Indonesia. This location was selected because it is one of the areas with a high prevalence of stunting in West Sumatra, Indonesia. This study employed a mixed-methods approach using a sequential explanatory design. In this design, quantitative data collection and analysis were conducted first to obtain an overview of the stunting prevalence, risk factors, and program achievements in Pasaman Barat District. Quantitative data were collected through household surveys, SSGI reports, and local health data. The results of the quantitative analysis were then further explored through qualitative data obtained from in-depth interviews, focus group discussions (FGDs), and field observations to understand the context, barriers, and dynamics of the stunting reduction program, as well as to validate the quantitative findings.

This study was conducted through four main stages to understand the determinants of stunting in West Pasaman Regency and to develop evidence-based policy recommendations.

Stage 1: Situational Analysis

The situational analysis aimed to map the prevalence of stunting, the implementation of nutrition intervention programs, and factors affecting program outcomes. Quantitative data were collected through household surveys and regional health data. Field observations were conducted at integrated health posts (posyandu), community health centers (puskesmas), and program sites to assess community involvement and implementation challenges. Interviews with health workers, posyandu cadres, and village officials were conducted to obtain contextual information regarding program successes and barriers.

Stage 2: Root Cause Analysis

The determinants of stunting were analyzed using a Fishbone Diagram (Ishikawa Diagram) and categorized into nutrition and health, environment, socio-economic, institutional, and cultural/behavioral aspects. Focus group discussions (FGDs) with local government, academics, and health workers were conducted to validate quantitative findings and field observations, providing a comprehensive understanding of the root causes of stunting in the study area.

Stage 3: Mentoring/Assistance

Mentoring and assistance were carried out by a team comprising lecturers, students, and alumni to implement interventions directly. The mentoring targeted: Adolescent girls and pregnant women, through iron-folic acid supplementation for adolescent girls (*TTD Rematri*), iron-folic acid supplementation for pregnant women (*TTD ibu hamil*), and antenatal care (ANC); Children under five, through monitoring complementary feeding practices (*MP-ASI* and *PMBA*), provision of nutrition supplementation (PMT) using

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local food-based recovery and counseling standards, growth monitoring, immunization tracking, and immunization education; Recording and reporting, to ensure data quality and program accountability.

Stage 4: Advocacy and Policy Brief Development

Policy briefs were developed through collaborative workshops involving academics, local government, and stakeholders, to summarize key issues. The Poltekkes team, in collaboration with Provincial and District Health Offices, conducted advocacy, coordination, and dissemination through cross-sectoral forums to support the sustainable implementation of stunting reduction interventions.

Data Collection

Program coverage data were collected through routine health service records obtained from community health centers (puskesmas) and village health posts (posyandu) across Pasaman Barat District. Data included indicators of specific nutrition interventions such as growth monitoring, exclusive breastfeeding, complementary feeding, antenatal care, iron–folic acid (IFA) supplementation, and adolescent nutrition services.

Pre-intervention data were extracted from the June reporting period, while post-intervention data were obtained from the August reporting cycle. All data were collected using standardized reporting forms utilized by local health workers and verified by puskesmas nutrition officers to ensure accuracy and consistency. The research team validated the completeness of records and cross-checked entries to minimize reporting errors. Only indicators with complete paired data were included in the analysis. Figure 1 Shows Framework for Strengthening Specific Nutrition Interventions through Academic Collaboration.

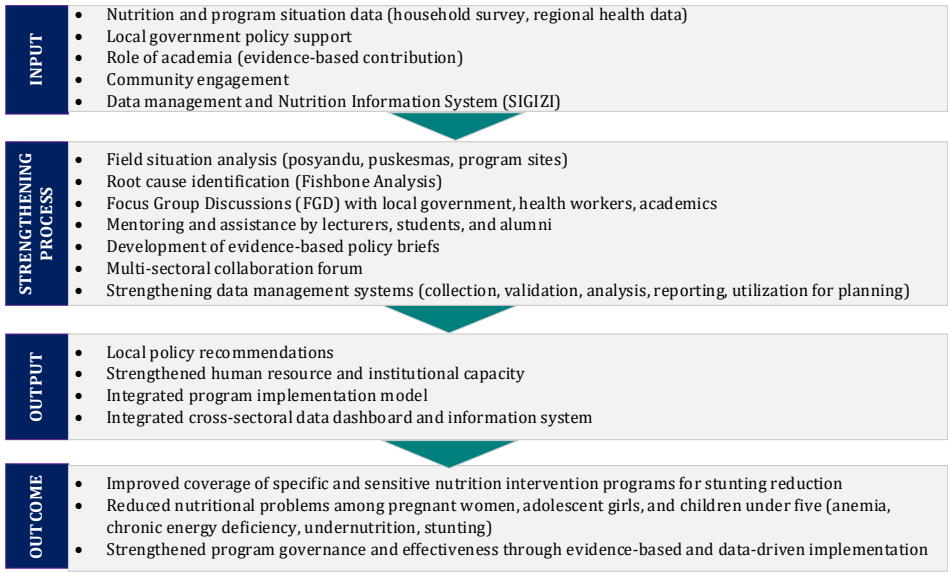

Figure 1. Framework for Strengthening Specific Nutrition Interventions through Academic Collaboration

Data Analysis

Data were analyzed using a quantitative pre–post approach. All coverage data from June (pre-intervention) and August (post-intervention) were compiled and checked for completeness. Descriptive statistics were used to calculate mean values and standard deviations for each indicator. To assess changes between the two time points, paired sample t-tests were performed because the same service units were measured before and after the intervention. A significance level of $p < 0.05$ was applied to determine statistical significance. All statistical analyses were conducted using standard procedures for public health program evaluation.

Code of Health Ethics

This study was registered and approved by the Health Research Ethics Committee (KEPK) of Poltekkes Kemenkes Padang, Number EC-006/KEPK-PDG/VIII/2025.

https://doi.org/10.56303/jhnresearch.v5i1.1087

RESULTS

Table 1. Results of the Situation Analysis on the Coverage of Specific Nutrition Intervention Programs for Stunting Reduction in Pasaman Barat

Health care unit in West Pasaman	Growth Monitoring	Exclusive Breastfeeding	Complementary Feeding Practices	Supplementary Feeding Program for Underweight Children	Early Initiation of Breastfeeding	Antenatal Care (Minimum 6 Visits)	Supplementary feeding program for pregnant	Iron–Folic Acid Supplementation for Pregnant Women	Anemia Screening in Adolescent Girls	Iron-Folic Acic Supplementation for Adolescent Girls
Air bangis	72.26	3.70	90.61	0.00	75.00	44.00	22.22	6.31	55.92	51.24
Silaping	63.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.23
Desa baru	76.18	0.00	99.65	0.00	77.78	0.00	100.00	37.04	100.00	.00
Parit	69.46	81.82	30.14	0.00	69.64	14.00	0.00	7.29	24.07	44.46
Sungai aur	47.79	.00	69.01	0.00	54.55	11.00	100.00	0.00	100.00	98.75
Ujung gading	98.82	65.52	69.07	0.00	65.00	0.00	0.00	0.00	0.00	
Ranah salido	81.89	0.00	38.74	0.00	100.00	0.00	0.00	9.85	100.00	39.03
Paraman ampalu	81.13	57.14	89.22	0.00	83.33	0.00	0.00	0.00	100.00	0.00
Muaro kiawai	64.58	26.67	72.73	0.00	100.00	0.00	100.00	17.89	97.83	0.00
Talu	21.61	0.00	0.00	0.00	100.00	0.00	0.00	35.29	0.00	10.30
Kajai	28.11	0.00	0.00	0.00	62.50	0.00	37.50	33.80	100.00	99.63
Suka menanti	4.56	0.00	0.00	0.00	93.75	0.00	0.00	0.00	90.34	91.40
Lbh.binuang	44.63	46.67	96.24	0.00	30.43	0.00	0.00	33.77	0.00	38.28
Simpang empat	94.15	0.00	0.00	58.00	85.71	75.00	100.00	36.44	100.00	0.00
Aia gadang	34.16	6.67	58.33	0.00	37.50	0.00	0.00	35.35	100.00	40.70
Ophir	70.10	72.13	85.71	0.00	73.68	0.00	0.00	52.74	100.00	0.00
Sasak	38.77	.00	0.00	0.00	.00	0.00	100.00	10.48	92.25	89.44
Kinali	21.57	13.51	95.51	0.00	73.53	87.00	48.89	36.33	0.00	93.53
Iv koto	16.68	6.25	0.00	0.00	100.00	67.00	0.00	10.30	0.00	93.23
Vi koto selatan	59.81	0.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00	14.70
Mean±SD	54.49±27.19	19.00±28.47	44.74±41.30	2.90±12.96	69.12±31.05	14.90±28.55	30.43±43.38	18.14±17.35	63.02±46.17	43.52±39.11

Data coverage based on Juni, 2025

https://doi.org/10.56303/jhnresearch.v5i1.1087

The coverage of specific nutrition intervention programs for stunting reduction in Pasaman Barat shows wide variability across health care units, indicating that implementation is still a significant challenge. Many indicators display low achievement, and numerous data points are incomplete or not updated, suggesting gaps in routine reporting and monitoring systems. This inconsistency reflects limited program reach, weak surveillance, and potentially insufficient capacity in service delivery at several health centers. Overall, the uneven coverage and missing data highlight the need for improved data management, more consistent implementation, and strengthened monitoring to ensure that stunting reduction efforts are effectively carried out across all areas.

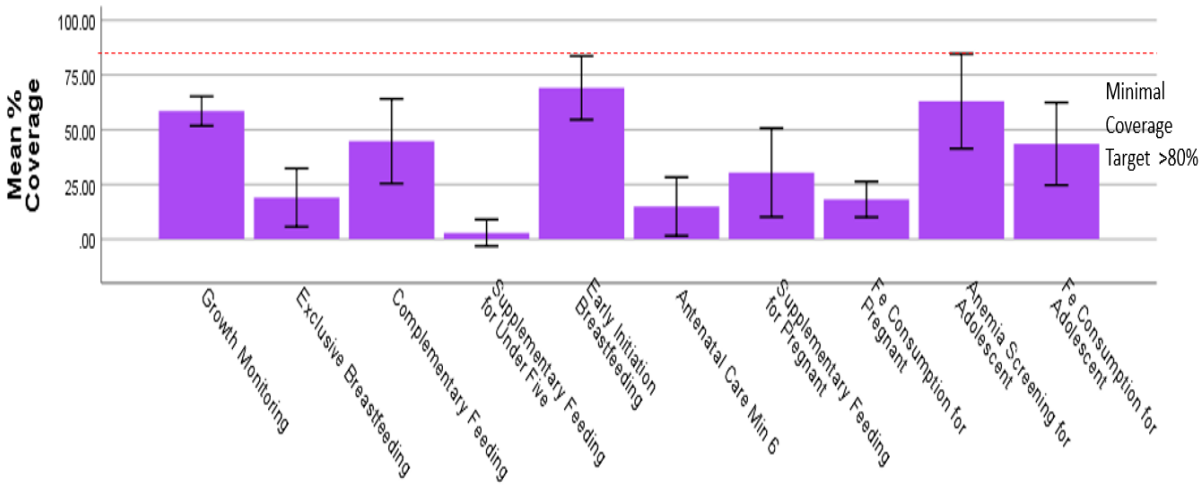

Figure 2. Coverage Intervention Specific to Prevent Stunting in West Pasaman, Indonesia

Figure 2 illustrates that most specific nutrition interventions for stunting prevention in West Pasaman remain below the Indonesian government's minimum coverage target of 80%. Only a few indicators approach or exceed the expected threshold, while the majority show relatively low achievement, reflecting gaps in implementation, service delivery, and utilization at the community level. This condition highlights the need for strengthened program execution, improved monitoring, and increased community engagement to ensure that intervention coverage can meet the national standards and contribute effectively to reducing stunting prevalence.

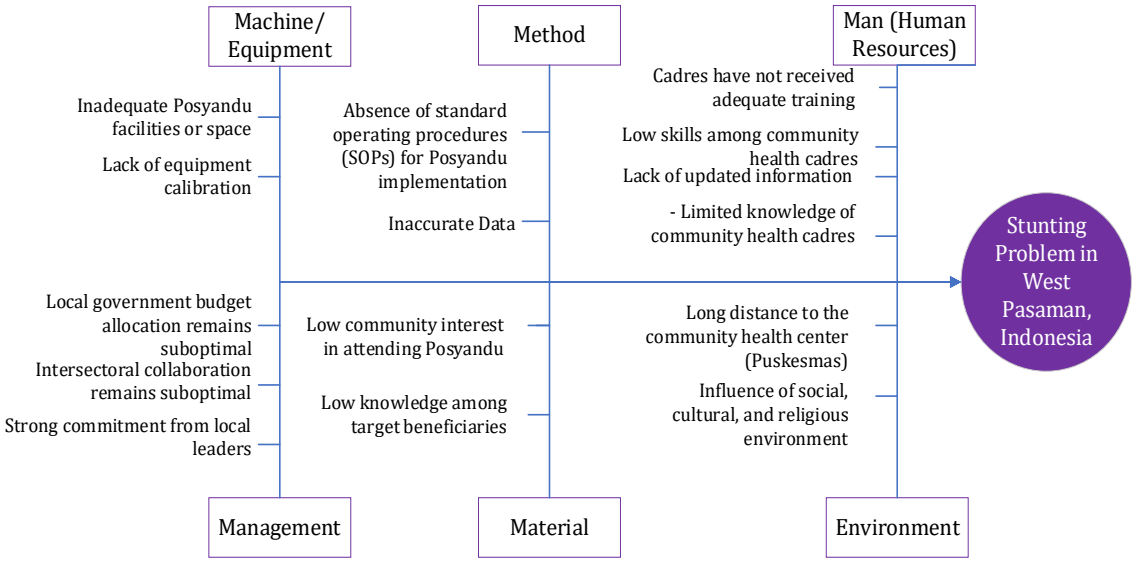

Figure 3. Ishikawa Factor Related Stunting in West Pasaman

Figure 3 shows that the nutrition problems and low coverage of stunting prevention programs in West Pasaman are influenced by multiple interconnected factors. From the human resource aspect, many

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community health cadres lack adequate training and updated knowledge, affecting the quality of service delivery. Method-related issues include the absence of standardized operating procedures and inaccurate data reporting, which hinder effective monitoring and evaluation. Limited facilities and inadequate equipment calibration further reduce program performance. At the management level, suboptimal budget allocation and weak intersectoral collaboration restrict program reach, while low community interest, limited beneficiary knowledge, and geographic and socio-cultural barriers also contribute to low participation in nutrition programs. Altogether, these factors highlight systemic challenges that must be addressed to improve intervention coverage and nutrition outcomes.

Table 2. Advocacy and Multisectoral Support for Stunting Prevention

Sector / Institution	Support and Strengthening Actions
Regent (Bupati)	Issuing a Decree of Commitment for Stunting Reduction
District Health Office	• Developing standard procedures for Posyandu implementation • Strengthening the roles and responsibilities of health workers in mentoring cadres • Establishing monitoring and supervision procedures for Posyandu
Subdistrict Head / Village Leader (Camat / Wali Nagari)	• Issuing circular letters encouraging community participation in Posyandu • Planning the establishment of Posyandu in each area • Allocating budgets for Posyandu implementation • Providing funds for Posyandu-related training • Coordinating with community health centers (Puskesmas) in managing Posyandu • Preparing necessary equipment for Posyandu operations
Community Health Center (Puskesmas)	• Strengthening the role of health workers in enhancing cadre skills • Conducting on-the-job training during Posyandu sessions • Providing training on measurement, plotting, and educational techniques for cadres • Enhancing health promotion activities for the community • Strengthening mobile health services (Puskesmas Keliling) to improve antenatal care (ANC) coverage
Higher Education Institutions	• Engaging students in community-based nutrition and health programs • Involving lecturers in research and development of health services
Department of Education	• Supporting supervision of iron–folic acid (IFA) tablet consumption among adolescents and school children • Reminding students to regularly consume IFA tablets
Religious Affairs Office	• Providing guidance to prospective brides and grooms to prepare for healthy marriage and pregnancy • Delivering religious-based messages to promote public participation in health programs such as immunization
Department of Communication and Information	• Producing educational materials through Instagram, TikTok, Facebook, posters, and other media related to maternal and child health and nutrition issues
Food Security Agency	• Maintaining the stability of food supply and prices for strategic commodities • Conducting early detection of food-insecure areas at risk of stunting
Family Welfare Movement Team (TP PKK)	• Supporting community awareness and participation in Posyandu activities
Regional Research and Development Agency (Balitbangda)	• Improving data accuracy on under-five children, poor households, and population distribution • Mapping target groups across subdistricts
Department of Agriculture	• Providing rice fortified with vitamin A and zinc for undernourished
Department of Social Affairs	• Providing affordable food assistance and social support to poor households vulnerable to nutritional problems

Table 2 demonstrates that stunting prevention in West Pasaman is supported through strong advocacy and multisectoral collaboration, involving government leadership, health institutions, education sectors, and community organizations. The Regent reinforces policy commitment through official decrees, while the District Health Office develops standards and supervision systems to strengthen Posyandu implementation. Local government leaders at the subdistrict and village levels provide operational and budgetary support, coordinate with Puskesmas, and help ensure that facilities and training are available. Community health centers further enhance cadre skills and service delivery through training and mobile health services. Beyond the health sector, schools oversee iron–folic acid tablet consumption among

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adolescents, religious offices help increase community awareness through faith-based messages, and communication agencies disseminate health information through various media platforms. Food security, agriculture, social affairs, and research agencies also contribute by ensuring food availability, providing fortified products, supporting vulnerable families, and improving data accuracy. Together, these synchronized efforts illustrate a comprehensive, multisectoral approach to improving nutritional outcomes and reducing stunting in the district.

Table 3. Recommended Strengthening Programs in Specific Interventions for Stunting Prevention

Program	Key Contributing Factors (Causes)	Potential Impacts	Recommended Strengthening Strategies
Growth Monitoring	• Limited cadre skills in accurate anthropometric measurement, • Inaccurate data recording • Low community participation in Posyandu	• Inaccurate growth assessment • Delayed detection and referral of growth faltering	• Conduct regular cadre training on measurement and plotting • Digitize growth monitoring tools • Enhance data verification and supervision from Puskesmas • Improve calibration and avalaiblity of anthropometric tools
Exclusive Breastfeeding	• Insufficient maternal knowledge • Early introduction of formula milk • Lack of family and workplace support	• Low exclusive breastfeeding rates • Higher vulnerability to infection and malnutrition	• Provide breastfeeding counseling during ANC and PNC • Develop mother support groups • Advocate workplace breastfeeding-friendly policies
Complementary Feeding Practices	• Low maternal knowledge about timing and food diversity • Poor household food access	• Inadequate nutrient intake among infants • Growth retardation and micronutrient deficiencies	• Conduct community-based IYCF education/counseling and practical demonstration • Integrate complementary feeding demonstration in Posyandu • Promote use of local nutrient-rich foods
Supplementary Feeding Program for Underweight Children	• Limited targeting accuracy • Inconsistent distribution and monitoring	• Minimal improvement in child nutritional status • Program inefficiency	• Ensure updated data and accurate identification of underweight children • Standardize monitoring and evaluation • Engage local food producers to support provision of nutrient-adequate supplementary goods
Early Initiation of Breastfeeding	• Lack of delivery assistance by trained personnel • Low awareness of EIB benefits • Cultural and religious misconceptions	• Delayed breastfeeding initiation • Reduced colostrum intake • Weaker maternal-infant bonding	• Strengthen health worker training on EIB • Integrate EIB message in antenatal classes and delivery services • Promote culturally sensitive health education
Antenatal Care (Minimum 6 Visits)	• Limited access to health facilities • Low awareness of ANC importance among pregnant women and families • Inadequate follow-up by health workers and reminder systems	• Missed detection of pregnancy complications • Poor maternal nutritional monitoring • Increase risk of adverse birth outcomes	• Improve outreach services and mobile clinics • Strengthen home visit follow-ups and reminder mechanisms? • Incentivize early and regular ANC visits
Supplementary Feeding Program for Pregnant Women	• Limited funding and irregular distribution • Poor monitoring of nutritional impact	• Continued maternal undernutrition • Increased risk of low birth weight	• Standardize target criteria and ration composition • Monitor weight gain and hemoglobin levels

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Program	Key Contributing Factors (Causes)	Potential Impacts	Recommended Strengthening Strategies
Iron–Folic Acid Tablet Consumption among Pregnant Women	• Low compliance due to side effects • Poor counseling and stock-outs	• Persistent maternal anemia • Increased risk of preterm birth and low birth weight	• Collaborate with local food industry for fortified products • Strengthen counseling on benefits and side effects • Ensure continuous IFA supply • Integrate IFA consumption monitoring into ANC visits
Anemia Screening in Adolescent Girls	• Limited screening coverage at schools • Lack of laboratory capacity • Low awareness among parents and adolescents	• Undetected anemia and fatigue • Reduced learning performance • Increase future pregnancy risks	• Expand school-based anemia screening • Train school health units (UKS) • Raise awareness through adolescent health campaigns
Iron–Folic Acid Consumption among Adolescent Girls	• Low adherence due to forgetfulness or taste issues • Irregular school-based supervision • Limited understanding of anemia risks	• High prevalence of anemia • Increased vulnerability during future pregnancies	• Implement school-based IFA reminder systems • Integrate nutrition education in school curricula • Engage teachers and peer educators as role models

Table 3 outlines key challenges and recommended strategies to strengthen specific stunting prevention interventions, highlighting that each program is affected by gaps in knowledge, access, monitoring, and community participation. Issues such as limited cadre capacity, inaccurate data recording, low maternal awareness, inadequate food access, irregular program implementation, and poor compliance with supplementation contribute to delayed detection of growth problems, persistent undernutrition, and higher risks of anemia and poor pregnancy outcomes. To address these barriers, the table recommends solutions including improving cadre and health worker training, strengthening monitoring and evaluation systems, expanding community education, enhancing service outreach, increasing collaboration with schools and local food producers, and ensuring continuous availability of essential supplies. Collectively, these strategies emphasize the need for capacity building, better data systems, stronger community engagement, and more consistent program delivery to enhance the effectiveness of stunting prevention efforts.

The results in the table show that the pilot healthcare project led to improvements in several stunting prevention indicators, although not all changes were statistically significant. Significant increases were observed in growth monitoring coverage, exclusive breastfeeding, and iron–folic acid consumption among pregnant women, indicating that targeted interventions such as improved training, counseling, supervision, and service delivery likely contributed to measurable progress. Other indicators, including complementary feeding practices, antenatal care visits, supplementary feeding programs, and anemia screening in adolescents, showed numerical improvements but did not reach statistical significance, suggesting that the duration of intervention, scale of implementation, or persistent systemic challenges may have limited their impact. Overall, the findings indicate that the pilot project was successful in boosting key high-priority behaviors, but additional time, resources, and strengthening of program components may be needed to achieve significant improvement across all intervention areas.

Table 4. Impact Strengthening Specific Nutrition Interventions

Program Coverage (%)	Pre (Mean±SD) June	Post (Mean±SD) August	p-value
Growth Monitoring	54.49±27.19.39	97.43±5.26	0.00 (Significant)
Exclusive Breastfeeding	19.04±28.47	59.28±37.38	0.00 (Significant)
Complementary Feeding Practices	44.74±41.30	56.43±38.79	0.59 (No Significant)
Supplementary Feeding Program for Underweight Children	2.90±12.96	33.79±43.93	0.10 (No Significant)
Early Initiation of Breastfeeding (IMD)	69.12±31.05	68.58±25.25	0.93 (No Significant)
Antenatal Care (Minimum 6 Visits)	14.90±28.55	38.75±35.23	0.15 (No Significant)
Supplementary Feeding Program for Pregnant Women	30.39±43.97	54.25±43.65	0.16 (No Significant)

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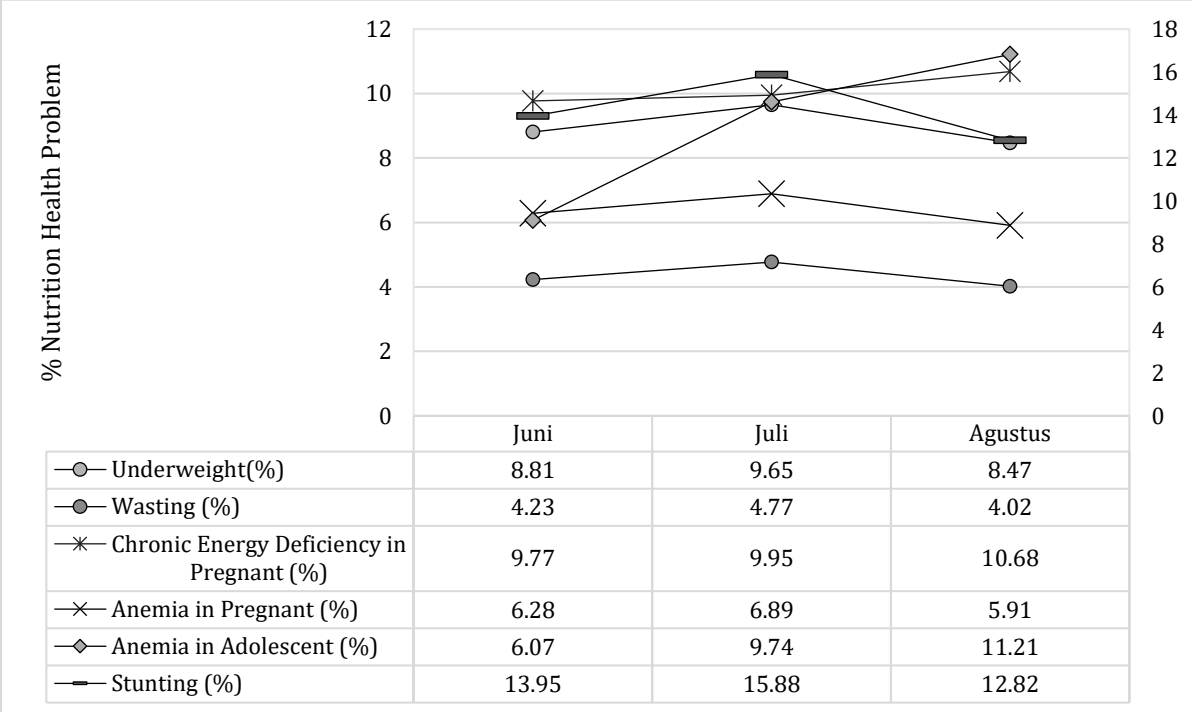
Program Coverage (%)	Pre (Mean±SD) June	Post (Mean±SD) August	p-value
Iron–Folic Acid (Fe) Tablet Consumption among Pregnant Women	22.28±16.96	85.28±24.62	0.00 (Significant)
Anemia Screening in Adolescent Girls	63.02±46.17	40.74±42.43	0.11(No Significant)
Fe Tablet Consumption among Adolescent Girls	43.52±39.11	44.66±42.11	0.95 (No Significant)



	Juni	Juli	Agustus
Underweight(%)	8.81	9.65	8.47
Wasting (%)	4.23	4.77	4.02
Chronic Energy Deficiency in Pregnant (%)	9.77	9.95	10.68
Anemia in Pregnant (%)	6.28	6.89	5.91
Anemia in Adolescent (%)	6.07	9.74	11.21
Stunting (%)	13.95	15.88	12.82

Figure 4. Trend of nutrition and health problems from June to August

Figure 4 illustrates the trend of key nutrition and health problems from June to August, showing that most indicators fluctuated slightly over the three-month intervention period. Underweight, wasting, anemia in pregnant women, and stunting showed slight improvement by August, suggesting that the pilot interventions may have contributed to early positive changes in nutritional status. However, chronic energy deficiency in pregnant women and anemia in adolescents continued to rise, indicating that these conditions require stronger or more targeted strategies to achieve meaningful improvements. Overall, the figure highlights that while some progress has been made, several nutrition problems remain prevalent and ongoing efforts are needed to strengthen program reach, compliance, and impact at the community level.

DISCUSSION

The findings of this study demonstrate that the coverage of specific nutrition interventions for stunting reduction in Pasaman Barat remains highly variable across health care units, reflecting ongoing challenges in service delivery, community engagement, and program implementation. On average, intervention coverage fell below the national target of 80%, indicating that many children, pregnant women, and adolescents are not yet receiving adequate nutrition services. The low coverage of key indicators—particularly antenatal care (ANC) visits, exclusive breastfeeding, growth monitoring, and iron–folic acid (IFA) consumption—suggests gaps in program reach, capacity, and adherence at both provider and beneficiary levels.

Growth monitoring coverage improved significantly during the pilot intervention, rising from 54.49% to 97.43%. This improvement can be attributed to strengthened capacity building among cadres, intensified supervision, and increased implementation of Posyandu activities. Similar patterns were observed in exclusive breastfeeding and IFA tablet consumption among pregnant women, both of which

https://doi.org/10.56303/jhnresearch.v5i1.1087

demonstrated statistically significant increases. These findings align with previous studies that show that structured counseling, community engagement, and strengthened monitoring systems contribute to improved maternal and child nutrition behaviors.(13–15) The improvements indicate that collaborative academic–government interventions can help accelerate progress when systematic program reinforcement is implemented.(16,17)

However, many other indicators showed non-significant improvements, including complementary feeding practices, supplementary feeding programs, and ANC visits. Several systemic challenges may explain these results. First, the duration of intervention may have been too short to produce measurable change in medium- to long-term behaviors such as antenatal follow-up, feeding practices, or correction of chronic undernutrition. Second, the Ishikawa analysis highlighted persistent constraints such as limited cadre skills, lack of standardized procedures, inadequate equipment, and weak data reporting systems. These structural challenges reduce the effectiveness of service delivery and inhibit continuous improvement based on routine data. (18)

Community-related factors also play a substantial role. Low maternal knowledge, limited access to nutrient-dense food, and cultural preferences—such as early introduction of infant formula or delayed initiation of breastfeeding—continue to hinder optimal feeding practices.(19) Maternal knowledge is a key determinant of optimal breastfeeding practices in Indonesia. Evidence indicates that mothers with better knowledge are significantly more likely to perform recommended breastfeeding behaviors, including exclusive breastfeeding, and that focuses counseling and support delivered by frontline workers are required to improve these practices.(20)

In addition, geographic barriers and limited transportation options reduce access to regular health services, particularly ANC visits and follow-up monitoring. These findings are consistent with literature showing that socio-cultural and access-related barriers contribute to suboptimal maternal–child health outcomes in rural settings. (21) To reduce unequal access caused by geogprahic constraints, policy efforts must be deliberately structured to target regions where ANC utilization remains low and ensure that service provision is more evenly distributed across the country. (22)

Table 2 further demonstrates that despite these challenges, there is strong multisectoral advocacy and policy support for stunting prevention in Pasaman Barat. Leadership from the district level, involvement of local government, and participation from education, agriculture, communication, religious affairs, and community organizations reflect a comprehensive whole-of-government approach. Such cross-sector collaboration is essential for addressing the multifactorial nature of stunting, as nutritional outcomes are shaped not only by health services but also by food security, education, household behaviors, social support, and information accessibility. Yet, as the results indicate, policy support alone does not guarantee implementation success unless it is accompanied by improved capacity, accountability, and behavior change strategies.(23) Strong political will from local leaders to enforce established local regulations is crucial for enhancing acceleration of stunting reduction. Good coordination and collaboration among government and non-government agencies, as well as active community engagement with stunting reduction programs at the local level, are key to successful implementation. (24)

The results also reveal contrasting trends in adolescent nutrition. While anemia screening coverage declined during the intervention period, IFA consumption among adolescents remained stagnant. This indicates insufficient follow-up in schools, weak compliance monitoring, and limited awareness about anemia prevention among both adolescents and parents. Research in similar contexts shows that school-based nutrition programs require continuous supervision, reminders, and social reinforcement—strategies that were recommended in Table 3 but may not have been fully operationalized within the short pilot duration. Continuous monitoring and social support have been shown as key facilitators of IFA adherence among adolescents, with low supervision frequently identified as a barrier.(25)

Although several nutritional indicators—such as wasting, underweight, and anemia in pregnancy—showed slight improvement by August, chronic energy deficiency and anemia in adolescents continued to rise. This suggests that immediate improvements have begun but require sustained intervention to translate into stronger and lasting nutritional outcomes. More time, resource allocation, and deeper community behavior change efforts are necessary to address long-standing nutritional deficits and reduce

https://doi.org/10.56303/jhnresearch.v5i1.1087

intergenerational risk.

Overall, the study findings suggest that academic collaboration with local government has the potential to enhance program implementation, strengthen service quality, and improve data-driven decision making. However, persistent challenges in human resource competency, logistics, monitoring systems, and community participation must be addressed to achieve consistent progress. Strengthening data accuracy, digitalizing reporting systems, improving health worker training, expanding outreach through mobile services, and integrating social and behavioral communication strategies are critical steps toward achieving sustainable reductions in stunting prevalence in Pasaman Barat.

This study has several limitations that may affect the generalizability and interpretation of results. First, the intervention duration was relatively short, which may have limited measurable changes in medium- to long-term nutrition behaviors. Second, some data were missing or incomplete across several health centers, which could have affected the accuracy of trends and coverage estimates. Finally, the absence of a control or comparison group makes it difficult to attribute observed improvements solely to the academic–government collaboration model.

CONCLUSION

This study demonstrates that effective stunting reduction in Pasaman Barat requires not only improvements in technical program implementation but also stronger systemic support through evidence-based policymaking. The academic–government collaboration model developed in this study provides a strategic framework to translate research findings into actionable policy decisions, ensuring that interventions are tailored to local needs, resource availability, and service delivery challenges. Pilot results indicate promising improvements in key nutrition indicators, including growth monitoring, exclusive breastfeeding, and iron–folic acid (IFA) supplementation among pregnant women, supported by capacity building, structured supervision, and strengthened multisectoral engagement. Despite these gains, many coverage indicators remain below national targets, and persistent challenges such as chronic energy deficiency and adolescent anemia highlight the need for ongoing program refinement, community empowerment, and enhanced monitoring systems.

To address these gaps, we propose the following concrete actions: implementing digital growth monitoring tools at Posyandu to improve real-time data collection and reporting; developing standardized training modules for cadres to strengthen skills in nutrition counseling, data recording, and community engagement; strengthening school-based supervision systems for adolescent IFA supplementation to increase adherence and coverage; and enhancing multisectoral coordination mechanisms to ensure continuous support and accountability across health, education, and community services.

Further studies are needed to evaluate the long-term impact and scalability of the academic–government collaboration model. Recommended directions include conducting longitudinal evaluations to measure sustained outcomes of nutrition interventions, expanding implementation to additional districts to validate the model under diverse contexts, and designing studies with control or comparison groups to isolate the effects of the collaboration model on stunting reduction. Overall, sustained and institutionalized partnerships between researchers, policymakers, and service providers are critical to generating continuous data-driven improvements, enhancing program accountability, and accelerating progress toward long-term stunting reduction in Pasaman Barat.

FUNDING

This research received funding from Poltekkes Kemenkes Padang and the Investing in Nutrition in Early Years (INEY) Project supported by the World Bank and the Ministry of Health of Indonesia. No additional external funding was received. The APC was funded by Poltekkes Kemenkes Padang.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to the Pasaman Barat District Health Office for their administrative assistance, technical support, and valuable contributions throughout the implementation of this study.

https://doi.org/10.56303/jhnresearch.v5i1.1087

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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