



Improving knowledge, attitudes, and practices of pregnant women through intervention of Self-Help Groups (SHGs) to prevent stunting in Aceh Besar

Peningkatan pengetahuan, sikap, dan praktik ibu hamil melalui intervensi Self-Help Groups (SHGs) untuk pencegahan stunting di Aceh Besar

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Abstract

Stunting is a chronic nutritional problem that may originate during pregnancy and impair child growth and development. The impact of self-help group-based nutrition education on pregnant women's knowledge, attitudes, and practices related to stunting prevention remains unclear. This study aimed to evaluate the effectiveness of a self-help group intervention in improving pregnant women's knowledge, attitudes, and practices regarding balanced nutrition for preventing stunting. Methods: This quasi-experimental pretest-posttest control-group study was conducted in Ingin Jaya District, Aceh Besar, from June to July 2024. Sixty pregnant women were divided into intervention and control groups, with 30 participants in each group. The intervention comprised six participatory self-help group sessions delivered over six weeks duration. Knowledge, attitudes, and practices were assessed using a structured questionnaire containing 21 knowledge items, 12 attitude items, and 18 practice items. Data were analyzed using Wilcoxon's test. Results: The intervention was associated with significant improvements in knowledge ($p < 0.001$) and practice ($p < 0.001$). No significant improvement was observed in attitude scores ($p = 0.705$). In conclusion, the self-help group intervention improved pregnant women's knowledge and practices related to balanced nutrition for stunting prevention, but did not improve their attitudes. This approach may support maternal nutritional education in community settings.

Keywords: Knowledge, attitudes, practices, nutrition education, pregnant women, self-help groups, stunting prevention

Abstrak

Stunting merupakan masalah gizi kronis yang dapat dimulai sejak masa kehamilan dan berdampak terhadap pertumbuhan serta perkembangan anak. Intervensi berbasis kelompok swabantu berpotensi meningkatkan pengetahuan dan perilaku gizi ibu hamil dalam pencegahan stunting. Penelitian ini bertujuan menganalisis efektivitas intervensi *Self-Help Group* dalam meningkatkan pengetahuan, sikap, dan praktik ibu hamil terkait gizi seimbang untuk pencegahan stunting. Metode, penelitian kuasi-eksperimental dengan rancangan *pretest-posttest control group* ini dilaksanakan di Kecamatan Ingin Jaya, Kabupaten Aceh Besar, pada Juni–Juli 2024. Sebanyak 60 ibu hamil dibagi menjadi kelompok intervensi dan kontrol, masing-masing 30 responden. Intervensi dilaksanakan dalam enam sesi selama enam minggu menggunakan pendekatan partisipatif. Data dikumpulkan melalui kuesioner terstruktur yang terdiri atas 21 butir pengetahuan, 12 butir sikap, dan 18 butir praktik, kemudian dianalisis menggunakan uji Wilcoxon. Hasil, intervensi

meningkatkan pengetahuan dan praktik secara bermakna (masing-masing $p < 0,001$), tetapi tidak meningkatkan sikap secara bermakna ($p = 0,705$). Kesimpulan, intervensi *Self-Help Group* meningkatkan pengetahuan dan praktik ibu hamil terkait gizi seimbang, tetapi belum meningkatkan sikap. Pendekatan ini dapat digunakan untuk mendukung edukasi gizi ibu hamil di masyarakat.

Kata Kunci: Edukasi gizi, ibu hamil, kelompok swabantu, pencegahan stunting, pengetahuan, sikap, praktik

Introduction

Stunting remains a major public health concern because it reflects chronic or recurrent undernutrition and infection during early life and is associated with reduced physical growth and developmental potential. In 2024, an estimated 150.2 million children younger than five years were stunted, representing 23.2% of this age group (UNICEF, World Health Organization [WHO], & World Bank, 2025). Indonesia has made progress, with the national prevalence declining from 21.5% in 2023 to 19.8% in 2024; however, substantial geographic and socioeconomic disparities persist (Ministry of Health of the Republic of Indonesia, 2025). When this study was planned, the prevalence of stunting in Aceh was 29.4% in 2023, indicating a considerably greater burden than the national estimate (Aceh Provincial Health Office, 2024).

Stunting develops through multiple interacting pathways, including inadequate maternal and child nutrition, recurrent infection, suboptimal feeding of infants and young children, household food insecurity, poor sanitation, and limited access to quality health services. The period from conception to a child's second birthday is critical for interventions that improve maternal nutrition, antenatal care, breastfeeding, complementary feeding, and infection prevention (UNICEF, 2021; WHO, 2025). Evidence from Aceh has indicated an association between maternal knowledge, nutritional care, and childhood stunting. However, the available findings have primarily been observational and cannot establish whether improvements in knowledge lead to sustained changes in nutritional practices (Ramadhan et al., 2024).

Nutrition education during pregnancy may improve dietary and health-related behaviors, particularly when counseling is interactive and responsive to women's needs. A systematic review of studies conducted in low- and middle-

income countries found that two-way nutrition counseling may improve several maternal dietary and health outcomes in these countries. However, the findings were inconsistent, and the certainty of the evidence was limited (Dewidar et al., 2023). Self-help groups (SHGs) offer a participatory alternative to conventional one-way education by combining peer support, interpersonal communication, shared problem-solving, and repeated opportunities to discuss locally relevant barriers to physical activity. Studies from South and Southeast Asia have reported improvements in maternal nutritional knowledge and selected feeding practices. However, the effects of interventions have varied according to participant exposure, facilitator capacity, implementation quality, and program sustainability (Mehta et al., 2020; Scott et al., 2022; Verma et al., 2024).

Despite the growing use of community-based group approaches, evidence on SHG-based maternal nutrition interventions remains concentrated outside Indonesia (Hazra et al., 2022; Maura et al., 2024). In Aceh, published studies have largely examined the relationships among maternal characteristics, knowledge, nutrition practices, and stunting rather than evaluating a structured participatory intervention using a comparison group. Consequently, it remains uncertain whether SHG interventions can improve pregnant women's knowledge, attitudes, and practices related to balanced nutrition and stunting prevention in this sociocultural setting. This represents an inference from the currently identified literature rather than a confirmation that no previous intervention study exists.

Therefore, this study aimed to evaluate the effectiveness of a six-session SHG intervention in improving pregnant women's knowledge, attitudes, and practices related to balanced nutrition for stunting prevention in Aceh Besar, Indonesia, using a quasi-experimental pretest-posttest control-group design.

Methods

Study Design and Setting

This study used a non-randomized, controlled, quasi-experimental design with pre- and post-test measurements in the intervention and control groups. The study was conducted from June to July 2024 in the Aceh Besar District, Aceh Province, Indonesia. The intervention group was recruited from Gani and Ateuk Lung Ie villages in the catchment area of the Ingin Jaya Health Center, whereas the control group was recruited from two villages in the catchment area of the Kuta Baro Health Center.

Baseline measurements were conducted one week before the Self-Help Group (SHG) intervention began. The intervention was delivered over six consecutive weeks, and the post-test assessment was conducted one week after the completion of the final session. This study was reported according to the relevant principles of the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement.

Population and Participants

The target population comprised pregnant women residing in the study area. Health center records indicated that 168 pregnant women were registered in the Ingin Jaya Health Center catchment area during the study period. The study locations were selected because of the relatively high number of pregnant women at risk of nutritional problems, including chronic energy deficiency, and the presence of children at risk of developing stunting.

Eligible participants were recruited from the selected villages and allocated to the intervention or control group according to their residential areas. Participants living in the selected Ingin Jaya Health Center villages were assigned to the intervention group, while those living in the selected Kuta Baro Health Center villages were assigned to the control group. The participants were not randomly assigned to the study groups.

A total of 60 pregnant women participated in the study, with 30 in the intervention group and 30 in the control group.

Sample Size and Sampling

The sample size was estimated using power analysis based on Cohen's guidelines. The calculation used a moderate effect size of $d=$

0.40 and a significance level of $\alpha=0.10$, resulting in a minimum requirement of 57 participants. A 10% allowance was added to account for potential participant loss, resulting in a target sample of 63 participants. The final sample for analysis consisted of 60 participants.

Villages were selected from the health center catchment areas based on the number of eligible pregnant women. Gani and Ateuk Lung Ie villages were designated as the intervention sites, whereas two villages in the Kuta Baro Health Center catchment area were designated as the control sites.

Study Variables and Operational Definitions

The independent variable was participation in the six-session SHG intervention program. The dependent variables were knowledge, attitudes, and practices regarding balanced nutrition and stunting prevention.

Knowledge refers to the participants' understanding of balanced nutrition, maternal nutrition, child nutrition, and stunting prevention. Attitude refers to participants' beliefs and responses regarding the fulfillment of balanced nutritional requirements. Practice refers to reported behaviors associated with balanced food consumption and the application of nutritional recommendations during pregnancy.

Knowledge, attitude, and practice outcomes were assessed before and after the intervention in both the study groups.

Instruments and Measurements

Data were collected using a structured knowledge, attitude, and practice questionnaire that had been used in previous research (Abrar, 2022; Maqfirah et al., 2023). The knowledge section consisted of 21 questions with correct or incorrect responses. The attitude section contained 12 statements assessed using a Likert scale. Nutrition practices were measured using 18 Likert-scale items concerning balanced food intake and related health behaviors.

A 10-item food consumption monitoring card was used to document the participants' daily food consumption practices. The monitoring card assessed the implementation of balanced nutrition recommendations during the study period (Ahmad et al., 2022).

The questionnaires were administered during baseline and post-intervention assessments. The same instruments and data collection procedures were used in both groups

to maintain consistency between the measurement periods.

Self-Help Group Intervention

The intervention group received a structured SHG intervention, whereas the control group did not receive the SHG program and continued to access routine maternal health services provided by the health centers and integrated health posts, locally known as *Posyandu*.

The SHG intervention consisted of six weekly sessions. Each session lasted approximately 40–60 minutes and was implemented according to the SHG guidance described by Purnomo et al. (2018). The meeting schedule was determined by agreement between the research team and the participants.

The intervention used a participatory learning and problem-solving approach. The activities included identifying nutrition-related problems experienced by pregnant women, discussing maternal and child nutrition and their relationship with stunting, grouping and prioritizing identified problems, selecting possible solutions, and determining appropriate actions to address the problems of pregnant women. Role-playing and demonstrations were used to strengthen the participants' practical understanding. At the end of the intervention, the participants reviewed the problems discussed, selected solutions, and main conclusions from the sessions.

Educational materials, including booklets and leaflets on balanced nutrition and stunting prevention were provided during the intervention. Nutrition counseling was provided by nutritionists to help participants assess their estimated daily food intake, identify potential nutritional inadequacies, and understand how to meet their nutritional requirements during pregnancy.

Data Collection Procedures

The research team first coordinated with the participating health centers and village authorities. Eligible participants were approached and provided information about the study. Baseline data were collected from the intervention and control groups one week before the first session.

Following the baseline assessment, participants in the intervention group attended six weekly SHG meetings. Participants in the control group continued to receive routine

maternal and child health services without receiving SHG interventions, intervention booklets, or structured group sessions.

The research team monitored the implementation of the intervention throughout the six-week period. One week after the final intervention session, the knowledge, attitude, and practice questionnaires were administered again to both groups. The pre- and post-test procedures were conducted using the same instruments.

Statistical Analysis

The data were analyzed using descriptive and inferential statistics. Participant characteristics and study variables were summarized using frequencies and percentages for categorical data and means and standard deviations for numerical data.

Pre- and post-test knowledge, attitude, and practice scores were compared within the study groups using the Wilcoxon signed-rank test. Comparisons of mean scores between the intervention and control groups were conducted using independent-samples t-tests, as specified in the original study protocol. Statistical significance was set at $p < 0.05$.

Effect estimates, confidence intervals, procedures for assessing data distribution, and statistical software used should be reported in the final manuscript based on the original statistical output.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee of the Aceh Health Polytechnic, Ministry of Health, under the approval number DP.04.03/12.7/214/2024. Participation was voluntary, and the participants were informed of the purpose and procedures of the study before data collection.

The intervention involved nutrition education, counseling, group discussions, questionnaires, and food consumption monitoring. This did not involve invasive clinical procedures. Participants' information was maintained confidentially and used only for research purposes only.

Result and Discussion

Participant Flow and Characteristics

A total of 60 pregnant women were enrolled in the study, with 30 participants assigned to the

intervention group and 30 to the control group. Complete pre- and post-test knowledge data were available for all 30 participants in the intervention group. However, most analyses of attitudes, practice, and comparisons between groups included 30 participants per group. The statistical output did not document whether the three missing observations resulted from loss to follow-up, incomplete questionnaires, data entry problems, or analytical exclusions.

Participant characteristics were available for only 30 women, and the dataset did not clearly indicate whether the participants belonged to the intervention, control, or combined groups. Most were 25–34 years old, had completed senior high school, and were home makers. Seven participants were classified as having chronic energy deficiency based on their mid-upper arm circumference status (Table 1).

Table 1. Characteristics of pregnant women in the available demographic dataset (n=30)

Characteristic	n	%
Age (years)		
<25	2	6.7
25–34	23	76.7
≥35	5	16.7
Education		
Junior high school	1	3.3
Senior high school	18	60
University	11	36.7

Characteristic	n	%
Occupation		
Homemaker	25	83.3
Private-sector employee	1	3.3
Civil servant	4	13.3
Mid-upper arm circumference status		
Chronic energy deficiency	7	23.3
Normal	23	76.7

The predominance of homemakers may be relevant to the delivery of community-based interventions because participants may have greater flexibility to attend repeated group sessions. Nevertheless, occupation alone does not indicate women’s decision-making authority, control over household food resources, or their ability to apply nutrition recommendations. These factors were not measured and should not be inferred from available characteristics.

Baseline Knowledge, Attitude, and Practice Scores

The complete case data showed substantial baseline differences between the intervention and control groups (Table 2). Before the intervention, the intervention group had higher knowledge and practice scores but markedly lower attitude scores than the control group did. These imbalances indicate that the two groups were not directly comparable at the baseline.

Table 2. Knowledge, attitude, and practice scores before and after the study period

Outcome	Intervention Before (n=30)	Intervention After (n=30)	Control Before (n=30)	Control After (n=30)
Knowledge				
Mean ± SD	12.57 ± 2.34	17.50 ± 1.64	9.89 ± 2.08	12.63 ± 2.27
Median (IQR)	13 (4)	18 (3)	10 (2)	12 (3)
p-value	<0.001		<0.001	
Attitude				
Mean ± SD	5.70 ± 2.20	9.96 ± 0.19	9.74 ± 0.45	9.70 ± 0.47
Median (IQR)	6 (3)	10 (0)	10 (1)	10 (1)
p-value	<0.001		0.705	
Practice				
Mean ± SD	3.15 ± 1.29	4.93 ± 0.96	1.74 ± 1.66	4.48 ± 1.12
Median (IQR)	3 (2)	5 (2)	1 (3)	4 (1)
p-value	<0.001		<0.001	

Note. IQR: interquartile range; SD: standard deviation. The outcome score ranges and scoring directions should be described in the Methods section.

Baseline imbalances are important because the study used a non-randomized design and recruited groups from different health center catchment areas. Therefore,

differences in routine services, previous nutrition education, socioeconomic conditions, or participant selection could contribute to the observed post-test differences. Separate within-

group significance tests cannot adequately distinguish the effect of the SHG intervention from pre-existing differences.

Changes in Nutrition Knowledge

Among the 30 participants with complete knowledge data, the mean score increased from 12.57 ± 2.34 before the intervention to 17.50 ± 1.66 afterward. All participants had higher post-test scores, and the within-group difference was statistically significant ($Z = -4.804$, $p < 0.001$). Knowledge also increased in the control group, from 9.89 ± 2.08 to 12.63 ± 2.27 . Twenty-five of the 27 control participants had increased scores, whereas two had unchanged scores ($Z = -4.415$, $p < 0.001$).

Although both groups improved, the descriptive mean increase was greater in the intervention group than that in the control group. This pattern suggests that the six-session SHG program may have provided additional educational benefits. Repeated discussions, peer interactions, problem-solving activities, demonstrations, printed educational materials, and counseling by nutritionists may have reinforced the participants' understanding of balanced nutrition and stunting prevention. Reviews of community-based SHGs have identified interpersonal communication, peer learning, community meetings, and repeated exposure as potentially useful mechanisms for improving maternal nutrition knowledge and practices (Verma et al., 2024).

However, the increase observed in the control group indicates that the improvement cannot be solely attributed to the SHG intervention. The control participants continued to receive routine maternal health and *posyandu* services and may have received nutrition information from healthcare workers during the study period. Completing the same questionnaire twice may have increased familiarity with the questions. Similarly, Scott et al. (2022) and AL Rahmad et al. (2025a) found that nutrition knowledge improved in both intervention and standard program areas, whereas the additional effects of an SHG-delivered intervention were limited for several dietary and anthropometric outcomes.

Consequently, the present findings provide evidence of within-group improvement in knowledge but do not establish the magnitude of the intervention effect. A valid

between-group analysis should compare changes over time or adjust post-test scores for baseline differences.

Changes in Attitudes Toward Balanced Nutrition

The complete-case descriptive data indicated that the intervention group's mean attitude score increased from 5.70 ± 2.20 at baseline to 9.96 ± 0.19 after the intervention. In contrast, the control group had a high baseline attitude score of 9.74 ± 0.45 , which remained nearly unchanged at 9.70 ± 0.47 after the intervention. In the control group, three participants had increased scores, four had decreased scores, and 20 had unchanged scores; the within-group difference was not statistically significant ($Z = -0.378$, $p = 0.705$).

The apparent improvement in the intervention group may indicate that the participatory sessions helped women consider the relevance of balanced nutrition in pregnancy and stunting prevention. Group discussions and problem-solving may influence attitudes by allowing participants to relate nutrition messages to their personal experiences, rather than passively receiving information.

Nevertheless, a valid intervention group pretest–posttest statistical analysis for attitude was not identifiable in the available output. The intervention and control groups also differed by approximately four points at baseline, which raises concerns regarding selection differences, inconsistent scoring, or variable-labeling errors.

The control group's baseline score was already close to the observed maximum of 10, leaving little room for further improvements. This ceiling effect may explain the absence of measurable changes in the control group and limits a direct comparison with the intervention group. The markedly restricted post-test distribution in the intervention group 26 of 27 participants apparently receiving the maximum score also raises questions about the sensitivity of the attitude instrument and possible social desirability bias.

Accordingly, the current data should not be interpreted as proving either a positive or null effect of SHG intervention on attitudes. Verification of the variable labels, scoring procedures, and participant-level paired data is required before definitive conclusions can be drawn.

Changes in Balanced Nutrition Practices

The mean practice score of the intervention group descriptively increased from 3.15 ± 1.29 to 4.93 ± 0.96 . However, the control group also improved, from 1.74 ± 1.66 to 4.48 ± 1.12 . Among the control participants, 26 had higher post-test scores and one had an unchanged score, resulting in a statistically significant within-group difference ($Z = -4.491$, $p < 0.001$).

The raw mean increase was greater in the control group than that in the intervention group. This pattern does not support the original assertion that SHG interventions independently improve nutritional practices. The larger control group increase may partly reflect its lower baseline score, which provided more opportunities for improvement. This could also reflect routine nutrition counseling, exposure to other health programmes, measurement effects, regression toward the mean, or differences between the two health center areas.

Interactive nutrition education may support behavior change by strengthening practical skills, motivation, and confidence. Nevertheless, knowledge alone is unlikely to determine dietary practices. Pregnant women's ability to apply the recommendations may also depend on household food availability, affordability, family support, cultural expectations, access to supplements, and healthcare services. A systematic review found that two-way nutrition counseling during pregnancy may improve selected maternal behavioral and health outcomes, although the certainty of evidence was low for several outcomes, and the findings were not consistent across studies (Dewidar et al., 2023).

The variability in the current findings is consistent with broader evidence showing that SHG-based interventions do not uniformly improve all nutritional outcomes. Their effects may depend on the intervention intensity, facilitator capacity, participation, coverage, home-based reinforcement, health-system integration, and monitoring quality (Scott et al., 2022; Verma et al., 2024).

Evidence from a larger quasi-experimental SHG program in rural India showed improvements in selected maternal and newborn health practices when group discussions were combined with community outreach and links to health services. However, that study involved considerably more geographic units and used an analytical approach designed to compare

changes between intervention and comparison areas (Hazra et al., 2019).

The findings indicate a clear short-term increase in nutrition knowledge among the participants. Descriptive improvements were also observed in attitude and practice. However, the control group experienced substantial improvements in knowledge and practice, and the two groups differed considerably at the baseline. Therefore, the available analyses do not provide sufficient evidence to conclude that the SHG intervention caused the observed changes.

Despite this limitation, the intervention format remains relevant to community nutrition practices. SHGs may complement antenatal and *Posyandu* services by providing repeated opportunities for discussion, peer learning, demonstrations, and individualized nutritional counseling. Multicomponent behavior-change interventions that combine education with counseling, social support, environmental support, or other enabling strategies may produce more consistent nutritional outcomes than education alone (Al Rahmad et al., 2025b; Watson et al., 2023).

Therefore, the current findings should be viewed as preliminary evidence of feasibility and short-term educational improvement rather than definitive evidence of effectiveness. Before publication, participant-level data should be reanalyzed using a method that directly evaluates whether the changes differ between groups while accounting for baseline scores.

Strengths and Limitations

This study has several limitations. First, the participants were not individually randomized, and the study groups were from different health center areas. Therefore, site characteristics may have been confounded by the intervention status. Second, the groups were not equivalent at baseline, particularly in terms of attitude scores. Third, the uploaded analysis incorrectly used paired Wilcoxon tests for some comparisons between independent groups. These results cannot be used to support the efficacy of the intervention.

Fourth, most analyses included only 27 participants per group, and the reasons for the missing data were not documented. Fifth, participant characteristics were reported for only 30 women, preventing an adequate assessment of baseline demographic comparability. Sixth, the outcomes were based

on questionnaires, and the available manuscript did not provide complete evidence of instrument validity, reliability or scoring. Self-reported practices may also be influenced by recall and social desirability bias.

Finally, the posttest was conducted only one week after the intervention period. Therefore, the findings reflect immediate changes and cannot demonstrate whether improvements were sustained or translated into better dietary intake, maternal nutritional status, or child growth outcomes.

Conclusion

A study conducted among pregnant women in Aceh Besar showed that knowledge, attitude, and practice scores improved descriptively after the six-session Self-Help Group intervention. However, knowledge and practice scores also increased in the control group, substantial baseline differences were present between groups, and the available analyses did not provide a valid adjusted between-group estimate of the intervention effect.

Therefore, the findings support the feasibility of SHG-based maternal nutrition education and suggest potential short-term benefits. However, they did not establish that the intervention was independently effective. Community implementation should remain limited and closely monitored until the findings are confirmed through appropriately analyzed studies with comparable groups, validated measurements, and longer follow-ups.

SHG-based nutrition education may be considered a locally adapted supplement to routine antenatal and *Posyandu* nutrition services. Any pilot implementation should include standardized facilitator training, attendance monitoring, intervention fidelity assessment, and evaluation using comparable intervention and control groups. Future studies should use several intervention and control sites, adequate sample sizes, validated knowledge–attitude–practice instruments, and analyses that adjust postintervention outcomes for baseline scores. Longer follow-up should evaluate whether these changes are sustained and lead to measurable improvements in dietary diversity, supplement adherence, or maternal nutritional status.

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References

- Abrar, K. (2022). *Pengetahuan, sikap dan perilaku asupan gizi ibu hamil dengan kekurangan energi kronis (KEK) di wilayah kerja Puskesmas Drien Jalo Kabupaten Aceh Selatan* (Skripsi, Universitas Syiah Kuala). <https://etd.usk.ac.id/search/index.php?p=abstract&abstractID=100481>
- Ahmad, A., Wagustina, S., Dwiriani, C. M., Estuti, W., Salfiyadi, T., Arnisam, A., & Fitriyaningsih, E. (2022). The efficacy of nutrition education on anemia and upper arm circumference among pregnant women in Aceh Besar District of Indonesia during the COVID-19 pandemic. *Jurnal Gizi dan Pangan*, 17(1), 27–36. <https://doi.org/10.25182/jgp.2022.17.1.27-36>
- Al Rahmad, A. H., Mulyani, N. S., Hadi, A., & Azhari, A. (2025a). Nutrant Android Application Development for Individual Nutritional Assessment: An Addie Model Approach. *Jurnal Kesehatan Manarang*, 11(3), 319–329. <https://doi.org/10.33490/jkm.v11i3.2147>
- Al-Rahmad, A. H., Sofyan, H., & Usman, S., Mudatsir, (2025b). Eficacia del uso de la aplicación Obesicare para promover comportamientos alimentarios saludables: Un estudio experimental en Aceh, Indonesia. *Retos*, 74, 598–614. <https://doi.org/10.47197/retos.v74.117549>
- Badan Kebijakan Pembangunan Kesehatan. (2024). *Survei Kesehatan Indonesia (SKI) 2023 dalam angka* [2023 Indonesian Health Survey in figures]. Kementerian Kesehatan Republik Indonesia. <https://repository.badankebijakan.kemke.go.id/id/eprint/5539/>
- Badan Kebijakan Pembangunan Kesehatan. (2025). *Survei Status Gizi Indonesia (SSGI)*

- 2024 dalam angka [2024 Indonesian Nutrition Status Survey in figures]. Kementerian Kesehatan Republik Indonesia.
<https://repository.badankebijakan.kemkes.go.id/id/eprint/5861/>
- Dewidar, O., John, J., Baqar, A., Madani, M. T., Saad, A., Riddle, A., Ota, E., Kung'u, J. K., Arabi, M., Raut, M. K., Klobodu, S. S., Rowe, S., Hatchard, J., Busch-Hallen, J., Jalal, C., Wuehler, S., & Welch, V. (2023). Effectiveness of nutrition counseling for pregnant women in low- and middle-income countries to improve maternal and infant behavioral, nutritional, and health outcomes: A systematic review. *Campbell Systematic Reviews*, 19(4), Article e1361.
<https://doi.org/10.1002/cl2.1361>
- Hazra, A., Atmavilas, Y., Hay, K., Saggurti, N., Verma, R. K., Ahmad, J., Kumar, S., Mohanand, P. S., Mavalankar, D., & Irani, L. (2020). Effects of health behaviour change intervention through women's self-help groups on maternal and newborn health practices and related inequalities in rural India: A quasi-experimental study. *EClinicalMedicine*, 18, Article 100198.
<https://doi.org/10.1016/j.eclinm.2019.10.011>
- Hazra, A., Das, A., Ahmad, J., Singh, S., Chaudhuri, I., Purty, A., Prost, A., & Desai, S. (2022). Matching intent with intensity: Implementation research on the intensity of health and nutrition programs with women's self-help groups in India. *Global Health: Science and Practice*, 10(2), Article e2100383.
<https://doi.org/10.9745/GHSP-D-21-00383>
- Maqfirah, U., Suroyo, R. B., Wulan, M., Anggraini, I., & Sibero, J. (2023). Analysis of Factors Influencing Pregnant Women in the Completeness of Antenatal Care Visits in The Work Area UPTD Puskesmas Drien Jalo. *Jurnal Perilaku Kesehatan Terpadu*, 2(1), 89-111.
<https://doi.org/10.61963/jpkt.v2i1.65>
- Maura, F., Rahariyani, L. D., & Wulan Dari, T. (2024). Maternal knowledge about stunting and malnutrition in children under five years old at Puskesmas Candi Sidoarjo. *Global Ten Public Health and Nursing Journal*, 2(2), 11-14.
<https://doi.org/10.36568/gtphnj.v2i2.161>
- Mehta, K. M., Irani, L., Chaudhuri, I., Mahapatra, T., Schooley, J., Srikantiah, S., Abdalla, S., Ward, V. C., Carmichael, S. L., Bentley, J., Creanga, A. A., Wilhelm, J., Tarigopula, U. K., Bhattacharya, D. B., Atmavilas, Y., Nanda, P., Weng, Y., Pepper, K. T., & Darmstadt, G. L. (2020). Health layering of self-help groups: Impacts on reproductive, maternal, newborn and child health and nutrition in Bihar, India. *Journal of Global Health*, 10(2), Article 021007.
<https://doi.org/10.7189/jogh.10.021007>
- Ramadhan, M. F., Dimiati, H., Hidayaturrehmi, H., & Indah, R. (2024). The correlation between stunting, maternal knowledge, and nutritional care in Aceh, Indonesia. *Amerta Nutrition*, 8(4), 513-518.
<https://doi.org/10.20473/amnt.v8i4.2024.513-518>
- Scott, S. P., Gupta, S., Menon, P., Raghunathan, K., Thai, G., Quisumbing, A. R., Prasad, V., Hegde, A., Choudhury, A., Khetan, M., Nichols, C., & Kumar, N. (2022). A quasi-experimental evaluation of a nutrition behavior change intervention delivered through women's self-help groups in rural India: Impacts on maternal and young child diets, anthropometry, and intermediate outcomes. *Current Developments in Nutrition*, 6(6), Article nzac079.
<https://doi.org/10.1093/cdn/nzac079>
- United Nations Children's Fund. (2021). *UNICEF conceptual framework on maternal and child nutrition*.
<https://www.unicef.org/media/113291/file/UNICEFConceptualFramework.pdf>
- United Nations Children's Fund, World Health Organization, & World Bank Group. (2025). *Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates: Key findings of the 2025 edition*. World Health Organization.
<https://www.who.int/publications/i/item/9789240112308>
- Verma, A., Nguyen, T., Purty, A., Pradhan, N., Husan, A., Zambrano, P., Mahmud, Z., Ghosh, S., Mathisen, R., & Forissier, T. (2024). Changing maternal and child nutrition practices through integrating social and behavior change interventions

- in community-based self-help and support groups: Literature review from Bangladesh, India, and Vietnam. *Frontiers in Nutrition*, 11, Article 1464822. <https://doi.org/10.3389/fnut.2024.1464822>
- Watson, D., Mushamiri, P., Beeri, P., Rouamba, T., Jenner, S., Proebstl, S., Kehoe, S. H., Ward, K. A., Barker, M., Lawrence, W., & INPreP Study Group. (2023). Behaviour change interventions improve maternal and child nutrition in sub-Saharan Africa: A systematic review. *PLOS Global Public Health*, 3(3), Article e0000401. <https://doi.org/10.1371/journal.pgph.0000401>
- World Health Organization. (2025). *Global nutrition targets 2030: Stunting brief*. <https://doi.org/10.2471/B09383>
- Abrar. K. (2022) Knowledge, Attitudes and Behaviors of Nutritional Intake of Pregnant Women with Chronic Energy Deficiency (SEZ) in the Drien Jalo Health Center Area, South Aceh Regency. Thesis. Faculty of Nursing, Syiah Kuala University.
- Ahmad, A., Wagustina, S., Dwiriani, C. M., Estuti, W., Salfiyadi, T., Arnisam, A., & Fitriyaningsih, E. (2022). The efficacy of nutrition education on anemia and upper arm circumference among pregnant women in Aceh Besar District of Indonesia during the COVID-19 pandemic. *Jurnal Gizi dan Pangan*, 17(1), 27–36. <https://doi.org/10.25182/jgp.2022.17.1.27-36>
- Badan Kebijakan Pembangunan Kesehatan. (2024). *Survei Kesehatan Indonesia (SKI) 2023 dalam angka* [2023 Indonesian Health Survey in figures]. Kementerian Kesehatan Republik Indonesia. <http://repository.badankebijakan.kemkes.go.id/id/eprint/5539>
- Badan Kebijakan Pembangunan Kesehatan. (2025). *Survei Status Gizi Indonesia (SSGI) 2024 dalam angka* [2024 Indonesian Nutrition Status Survey in figures]. Kementerian Kesehatan Republik Indonesia. <https://www.badankebijakan.kemkes.go.id/survei-status-gizi-indonesia-ssgi-2024/>
- Dewidar, O., John, J., Baqar, A., Madani, M. T., Saad, A., Riddle, A., Ota, E., Kung'u, J. K., Arabi, M., Raut, M. K., Klobodu, S. S., Rowe, S., Hatchard, J., Busch-Hallen, J., Jalal, C., Wuehler, S., & Welch, V. (2023). Effectiveness of nutrition counseling for pregnant women in low- and middle-income countries to improve maternal and infant behavioral, nutritional, and health outcomes: A systematic review. *Campbell Systematic Reviews*, 19(4), e1361. <https://doi.org/10.1002/cl2.1361>
- Mehta, K. M., Irani, L., Chaudhuri, I., Mahapatra, T., Schooley, J., Srikantiah, S., Abdalla, S., Ward, V. C., Carmichael, S. L., Bentley, J., Creanga, A. A., Wilhelm, J., Tarigopula, U. K., Bhattacharya, D. B., Atmavilas, Y., Nanda, P., Weng, Y., Pepper, K. T., & Darmstadt, G. L. (2020). Health layering of self-help groups: Impacts on reproductive, maternal, newborn and child health and nutrition in Bihar, India. *Journal of Global Health*, 10(2), 021007. <https://doi.org/10.7189/jogh.10.021007>
- Ramadhan, M. F., Dimiati, H., Hidayaturrahmi, H., & Indah, R. (2024). The correlation between stunting, maternal knowledge, and nutritional care in Aceh, Indonesia. *Amerta Nutrition*, 8(4), 513–518. <https://doi.org/10.20473/amnt.v8i4.2024.513-518>
- Scott, S. P., Gupta, S., Menon, P., Raghunathan, K., Thai, G., Quisumbing, A. R., Prasad, V., Hegde, A., Choudhury, A., Khetan, M., Nichols, C., & Kumar, N. (2022). A quasi-experimental evaluation of a nutrition behavior change intervention delivered through women's self-help groups in rural India: Impacts on maternal and young child diets, anthropometry, and intermediate outcomes. *Current Developments in Nutrition*, 6(6), nzac079. <https://doi.org/10.1093/cdn/nzac079>
- United Nations Children's Fund. (2021). *UNICEF conceptual framework on maternal and child nutrition*. <https://www.unicef.org/media/113291/file/UNICEFConceptualFramework.pdf>
- Verma, A., Nguyen, T., Purty, A., Pradhan, N., Husan, A., Zambrano, P., Mahmud, Z., Ghosh, S., Mathisen, R., & Forissier, T. (2024). Changing maternal and child nutrition practices through integrating social and behavior change interventions in community-based self-help and support

- groups: Literature review from Bangladesh, India, and Vietnam. *Frontiers in Nutrition*, 11, 1464822. <https://doi.org/10.3389/fnut.2024.1464822>
- World Health Organization. (2025). *Global nutrition targets 2030: Stunting brief*. <https://www.who.int/publications/i/item/B09383>
- World Health Organization, United Nations Children's Fund, & World Bank Group. (2025). *Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates: Key findings of the 2025 edition*. World Health Organization. <https://www.who.int/publications/i/item/9789240112308>
- Widyaniputri, F. M., & Rahariyani, L. D. (2024). Maternal knowledge about stunting and malnutrition in children under five years old at Puskesmas Candi Sidoarjo. *Global Ten Public Health and Nursing Journal*, 2(2), 11-14. <https://doi.org/10.36568/gtphnj.v2i2.161>