

Clinical pharmacists' education on nutritional supplements for community-based stunting prevention

A. Wardah Muzfah^{1*}, Trimaya Cahya Mulat², Darmi Arda², Maria Kurni Menga²

¹ Universitas Andi Sudirman, South Sulawesi, Indonesia

² Department of Nursing, Politeknik Sandi Karsa, South Sulawesi, Indonesia

Submitted: 2026-01-05; Revised: 2026-01-25; Accepted: 2026-02-02; Published: 2026-02-10

KEYWORDS:

Clinical pharmacists
Community education
Micronutrients
Nutritional supplements
Stunting prevention

ABSTRACT

Stunting remains a significant public health issue in Indonesia, closely linked to chronic undernutrition and micronutrient deficiencies during the first 1,000 days of life. Limited community knowledge regarding the rational use of nutritional supplements and micronutrients contributes to inappropriate practices that reduce the effectiveness of stunting prevention programs. This community service program aimed to improve community knowledge and awareness of appropriate nutritional supplement use through pharmacist-led education. The program was conducted using a structured, participatory approach consisting of situational analysis, educational material development, community education implementation, monitoring and evaluation, and follow-up activities. Clinical pharmacists delivered educational sessions through interactive lectures and discussions involving mothers, caregivers, and community health volunteers. Program evaluation was conducted using pre- and post-education assessments to measure changes in knowledge related to the roles of micronutrients, correct dosage and administration, safety considerations, and the complementary role of supplements in balanced nutrition. The results showed a clear improvement in participants' knowledge across all assessed indicators following the intervention. Participants demonstrated a better understanding of the importance of micronutrients for child growth, appropriate supplement use, and safety aspects, as well as increased awareness that supplements should support, rather than replace, balanced diets. These findings suggest that pharmacist-led community education is an effective strategy for strengthening stunting prevention efforts through the rational use of nutritional supplements.



e-ISSN: 3032-663X

*Corresponding author:

A. Wardah Muzfah

Universitas Andi Sudirman, South Sulawesi, Indonesia

Email: andiwadah26tn@gmail.com



This work is licensed under a Creative Commons Attribution 4.0 International License.

INTRODUCTION

Stunting remains one of the most pressing public health challenges in many low- and middle-income countries, including Indonesia. Defined as impaired linear growth resulting from chronic undernutrition during the first 1,000 days of life, stunting reflects not only insufficient nutrient intake but also recurrent infections, poor maternal nutrition, inadequate caregiving practices, and limited access to quality health services (Althabet et al., 2024). The consequences of stunting extend far beyond reduced height-for-age; it is strongly associated with delayed cognitive development, lower educational attainment, reduced productivity in adulthood, and increased risk of chronic diseases later in life (Amelia et al., 2025). As such, stunting is not merely a nutritional issue but a multidimensional problem that threatens human capital development and long-term national competitiveness (Anita et al., 2025).

Despite various national programs and policy commitments aimed at reducing stunting prevalence, gaps remain at the community level, particularly in nutrition education and the rational use of nutritional supplements and micronutrients. Many families, especially in underserved and rural communities, still lack adequate knowledge regarding appropriate nutrient requirements for pregnant women, infants, and young children (Buanasita et al., 2025). Misconceptions related to dietary diversity, inappropriate complementary feeding practices, and improper use of supplements, including both underuse and excessive consumption, are frequently observed. These gaps undermine the effectiveness of existing interventions and contribute to the persistence of stunting across generations (Hulaila et al., 2023).

Micronutrient deficiencies, including those of iron, zinc, iodine, vitamin A, and folic acid, play a significant role in the etiology of stunted growth. Although supplementation programs are widely promoted, their impact is often limited by poor adherence, a lack of understanding of correct dosage and duration, and a lack of individualized counseling (Jaisamrarn et al., 2023). In many community settings, nutritional supplements are often perceived as optional or used without professional guidance, which can diminish their preventive potential. Furthermore, inconsistent information disseminated through informal sources can lead to confusion and inappropriate practices among caregivers (Laksmi Puspa Sari et al., 2025).

In this context, healthcare professionals with strong pharmacological and clinical backgrounds play a critical role in strengthening community-based stunting prevention strategies. Clinical pharmacists, in particular, possess expertise in medication management, nutrient–drug interactions, dosage optimization, and patient education. Traditionally focused on hospital and clinical settings, the role of clinical pharmacists is increasingly expanding into public health and community engagement. Their involvement in nutrition education represents an underutilized but highly strategic approach to addressing micronutrient-related problems contributing to stunting (Mohsen et al., 2022).

The urgency of addressing stunting through innovative, community-oriented solutions highlights the need for interdisciplinary collaboration and task-sharing among health professionals. While physicians, nurses, and nutritionists remain central to maternal and child health services, clinical pharmacists can complement these roles by providing structured education on the rational use of nutritional supplements and micronutrients. Through targeted counseling, pharmacists can help caregivers understand the importance of specific nutrients, correct dosage, timing of administration, potential side effects, and interactions with commonly used medications or traditional remedies.

This approach not only improves adherence but also promotes safer and more effective use of supplements (Nnamani et al., 2025).

Education-based interventions led by clinical pharmacists offer a practical and scalable solution to existing gaps in stunting prevention efforts. Community education activities such as group discussions, counseling sessions, and the development of simple educational materials can be tailored to local contexts and literacy levels. By engaging directly with mothers, caregivers, and community health volunteers, clinical pharmacists can translate scientific knowledge into actionable guidance that supports optimal nutrition during critical periods of growth. Moreover, pharmacist-led education can strengthen community trust in health services by providing consistent, evidence-based information.

Another critical aspect of pharmacist involvement is promoting the rational use of supplements within existing health programs. Overreliance on supplements without addressing dietary diversity may limit sustainable improvements in nutrition. Clinical pharmacists are well-positioned to emphasize that supplements are complementary, not substitutes, for balanced diets. Through education, they can encourage appropriate food choices while ensuring that supplements are used correctly to address specific deficiencies. This balanced perspective is essential to achieving long-term reductions in stunting prevalence.

In addition, pharmacist-led community education aligns closely with the principles of community empowerment and preventive health. Rather than focusing solely on treatment, this approach emphasizes knowledge transfer, behavior change, and informed decision-making. Empowered caregivers are more likely to adopt healthy feeding practices, seek timely health services, and adhere to recommended supplementation regimens. Over time, these changes can contribute to improved child growth outcomes and reduced burden on healthcare systems. In conclusion, stunting represents a pressing and multifaceted public health issue that necessitates comprehensive, community-based solutions. Gaps in knowledge and practice related to nutritional supplements and micronutrients remain significant barriers to effective stunting prevention. Clinical pharmacists, through structured community education, offer a viable and innovative solution to these challenges. By leveraging their expertise in pharmacology and patient counseling, pharmacists can enhance the rational use of supplements, support caregiver understanding, and strengthen existing stunting prevention initiatives. Integrating clinical pharmacists into community education programs is therefore a promising strategy for accelerating progress toward reducing stunting and improving child health outcomes.

METHOD

This community service program was implemented using a structured, participatory approach consisting of five sequential stages. The methodology was designed to ensure relevance to community needs, effectiveness of educational delivery, and sustainability of outcomes in supporting stunting prevention through the rational use of nutritional supplements and micronutrients.

Situational Analysis and Needs Assessment

The first stage involved a situational analysis to identify community conditions related to stunting risk and micronutrient use. Data were collected through preliminary observations, informal interviews with community health workers, and discussions with mothers of infants and young children. This assessment aimed to identify common nutritional problems, existing knowledge gaps regarding supplement use, and prevalent misconceptions about micronutrients. The results of this stage served as the basis for

designing targeted educational materials and intervention strategies that were contextually appropriate and aligned with community needs.

Program Planning and Educational Material Development

Based on the findings of the needs assessment, the second stage focused on planning the educational intervention. A multidisciplinary team led by clinical pharmacists developed structured educational content covering essential micronutrients for maternal and child health, indications for supplementation, correct dosage, administration methods, potential side effects, and safety considerations. Educational materials, including presentation slides, leaflets, and simple visual aids, were designed using clear and culturally appropriate language to ensure comprehension by participants with varying literacy levels.

Community Education Implementation

The third stage involved implementing educational activities at the community level. Education sessions were conducted through interactive lectures, group discussions, and question-and-answer sessions facilitated by clinical pharmacists. Participants included mothers, caregivers, and community health volunteers. Emphasis was placed on two-way communication to encourage active participation and address specific concerns related to the use of nutritional supplements. Practical examples and real-life scenarios were used to enhance understanding and promote behavior change.

Monitoring and Evaluation

The fourth stage involved monitoring and evaluating the effectiveness of the education program. Evaluation was conducted using pre- and post-education assessments to measure changes in participants' knowledge and understanding of micronutrient use and stunting prevention. Observations during sessions and participant feedback were also collected to assess engagement and clarity of the materials. The evaluation results were used to identify the program's strengths and areas requiring improvement.

Follow-up and Sustainability Strategy

The final stage focused on follow-up activities and ensuring program sustainability. Coordination with local community health workers was conducted to reinforce key educational messages following the program's conclusion. Participants were encouraged to disseminate the information to other caregivers in their communities. Recommendations were also provided to integrate pharmacist-led nutrition education into routine community health activities, thereby supporting long-term efforts to prevent stunting.

RESULT AND DISCUSSION

RESULT

The community education program demonstrated positive outcomes in improving participants' knowledge and awareness regarding the rational use of nutritional supplements and micronutrients for stunting prevention. Post-education assessments revealed a significant increase in participants' understanding of the roles of key micronutrients, appropriate dosages, timing of administration, and safety considerations compared to baseline conditions. Participants showed improved ability to differentiate between supplements as complementary interventions and balanced diets as the primary foundation of child nutrition. Active engagement during discussion sessions reflected high acceptance of pharmacist-led education, particularly in addressing misconceptions and practical concerns related to supplement use. Feedback from participants and community health volunteers highlighted that the educational materials were easy to understand and relevant to daily caregiving practices. Overall, the program strengthened community capacity

to apply correct nutritional practices and supported efforts to prevent stunting through the informed and rational use of dietary supplements.

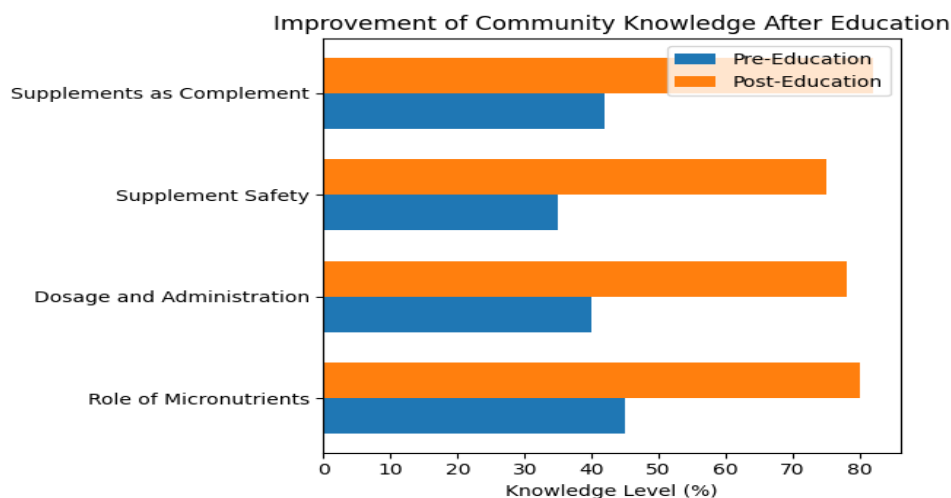


Figure 1. Improvement of Community Knowledge After Education

Figure 1. The bar chart demonstrates a clear and consistent improvement in community knowledge following the pharmacist-led educational intervention. Across all assessed indicators, post-education knowledge levels were substantially higher than pre-education levels, indicating that the academic activities were effective in addressing key gaps related to nutritional supplements and micronutrient use for stunting prevention. The largest improvement was observed in participants' understanding of the role of micronutrients, indicating that their basic conceptual knowledge was limited before the intervention. Following education, participants were better able to recognize the importance of essential micronutrients in supporting child growth and preventing stunted growth. This finding highlights the value of structured explanations delivered by clinical pharmacists in translating scientific concepts into practical community understanding.

Notable gains were also evident in the dosage and administration indicator. The increase in post-education scores reflects improved awareness of correct dosing, timing, and methods of supplement use. This is particularly important, as inappropriate dosing can reduce effectiveness or pose safety risks. The results indicate that pharmacist-led counseling successfully clarified these technical aspects for community members. Improvement in supplement safety awareness was another significant outcome. Before education, knowledge related to potential side effects and safe use was relatively low. The post-education increase suggests that participants became more informed about safety considerations, reinforcing the critical role of pharmacists in promoting rational and safe supplement use within the community. Finally, enhanced understanding of supplements as complementary to balanced nutrition indicates a positive shift in perception. Participants increasingly recognized that supplements should support, rather than replace, a balanced and adequate dietary intake. This finding is essential for ensuring sustainable nutritional practices and preventing overreliance on supplementation alone.

Overall, the observed improvements across all indicators confirm that community-based education led by clinical pharmacists is an effective strategy for strengthening

knowledge related to micronutrient use and supporting initiatives aimed at preventing stunting.

DISCUSSION

The findings of this community-based education program demonstrate that pharmacist-led educational interventions can significantly enhance community knowledge related to nutritional supplements and micronutrients for stunting prevention. The consistent improvements observed across all indicators, ranging from understanding micronutrient roles to appropriate dosage, safety, and the complementary nature of supplementation, underscore the relevance of involving clinical pharmacists in preventive public health initiatives, particularly at the community level (Nofitasari et al., 2025).

One of the most notable outcomes was the substantial increase in participants' understanding of the role of micronutrients in child growth and development. Before the intervention, limited awareness of essential micronutrients such as iron, zinc, iodine, and vitamin A suggested that caregivers may not fully appreciate their importance in preventing growth faltering (Rahmawati et al., 2021). Post-education improvements indicate that structured, pharmacist-led explanations were effective in addressing these conceptual gaps. This aligns with existing literature, which emphasizes that knowledge-based interventions are foundational to improving nutritional practices, especially in settings where misinformation or limited health literacy persists (Sada et al., 2025).

Improved knowledge regarding the correct dosage and administration of supplements represents another critical finding. Inappropriate dosing, either underuse or excessive use, has been identified as a common barrier to the effectiveness of supplementation programs (Schoeman, 2025). The observed increase in post-education scores suggests that participants gained a more precise understanding of how, when, and for whom supplements should be administered. Clinical pharmacists, with their expertise in pharmacotherapy and dosage management, are particularly well positioned to deliver this information accurately. This finding reinforces the argument that pharmacists can contribute beyond traditional dispensing roles, extending their impact to preventive and educational domains (Septi Fandinata et al., 2024).

The marked improvement in supplement safety awareness further highlights the value of pharmacist involvement. Before the intervention, knowledge related to potential side effects, contraindications, and interactions with other medications or traditional remedies was relatively low (Singla et al., 2023). Following education, participants demonstrated a greater awareness of safety considerations, which is essential for minimizing the risks associated with unsupervised supplement use. This outcome supports the notion that pharmacist-led education can promote rational use of supplements, a key principle in both pharmaceutical care and public health nutrition (Sun et al., 2023).

Another critical aspect of the results is the improved perception of supplements as complementary to, rather than substitutes for, balanced diets. Overreliance on supplements without adequate dietary diversity may undermine sustainable nutritional improvements (Suprpto, Arda, Kurni Menga, et al., 2025). The educational intervention

successfully conveyed that supplements are intended to address specific deficiencies while balanced diets remain the cornerstone of child nutrition. This balanced messaging is crucial in community settings, where economic constraints or misconceptions may lead to inappropriate prioritization of supplements over food-based strategies (Suprpto, Arda, Tri Wijayanti, et al., 2025).

The effectiveness of this program can also be attributed to its interactive and community-oriented approach. Engaging participants through discussions and question-and-answer sessions allowed educational content to be tailored to local contexts and real-life concerns. Such participatory methods are widely recognized as more effective than passive information delivery in achieving meaningful behavior change (Sylvia Bawilin & Suprpto, 2025). Moreover, involving community health volunteers in the educational process may enhance knowledge dissemination and reinforce key messages beyond the duration of the intervention.

From a broader perspective, the findings support the integration of clinical pharmacists into multidisciplinary efforts to prevent stunting. While nutritionists, midwives, and nurses traditionally play central roles in maternal and child health services, pharmacists can provide complementary expertise in supplement management and patient education. This interdisciplinary collaboration is particularly relevant in resource-limited settings, where optimizing the existing health workforce is essential for maximizing program impact (Azza et al., 2025).

Despite its positive outcomes, this community service program has certain limitations that should be taken into consideration. The assessment focused primarily on short-term knowledge improvement, and behavioral changes or long-term impacts on nutritional practices and child growth were not directly measured. Future programs should incorporate more extended follow-up periods and outcome indicators such as adherence to supplementation, dietary diversity, and anthropometric measures. Additionally, expanding the intervention to include a larger and more diverse population could enhance generalizability. Nevertheless, the results provide valuable insights into the potential of pharmacist-led community education as a practical and scalable strategy for stunting prevention. By addressing knowledge gaps related to micronutrient use, dosage, and safety, such interventions can strengthen existing public health programs and empower caregivers to make informed decisions about nutrition.

This study highlights the critical role of clinical pharmacists in community-based efforts to prevent stunting. The observed improvements in knowledge across multiple indicators suggest that pharmacist-led education is a practical approach to promoting rational supplement use and supporting optimal child nutrition. Integrating this model into routine community health activities may enhance the sustainability and effectiveness of stunting prevention initiatives, ultimately contributing to improved child health outcomes and human capital development.

CONCLUSION

This community-based education program demonstrated that pharmacist-led educational interventions effectively improved community knowledge regarding the rational use of nutritional supplements and micronutrients for stunting prevention. Significant increases were observed in understanding the roles of micronutrients, correct dosage and administration, supplement safety, and the complementary function of supplements in balanced nutrition. These findings confirm that clinical pharmacists can play a strategic role in strengthening efforts to prevent stunting through targeted community education.

It is recommended that pharmacist-led nutrition education be integrated into routine community health and stunting prevention programs. Future initiatives should include regular follow-up, collaboration with community health workers, and evaluation of long-term behavioral and nutritional outcomes to enhance sustainability and impact.

Acknowledgment

The authors would like to express their sincere appreciation to all community participants and local health volunteers for their active involvement in this program. Gratitude is also extended to the supporting institutions and colleagues who contributed to the successful implementation of this community education activity.

Conflict of Interests

All authors declare no conflict of interest in this community service program.

References

- Althabet, F. K., Almutairy, T. M., Almutairy, H. M., ALjabri, W., Alshammari, S. M. F., Alshammari, S. H. S., Albassri, L. H., Juraiby, N. A. A., Amiriyyah, N. A., & Madarba, R. Q. A. (2024). The Integration of Pharmacy Laboratory Diagnostics, and public Health in Tackling Nutritional Deficiencies. *Journal of International Crisis and Risk Communication Research*, 7(S11), 1464. <https://doi.org/10.63278/jicrcr.vi.1412>
- Amelia, V., Arief, Y. S., & Sylvia Dwi Wahyuni. (2025). Community-Based Intervention for Malnutrition in Children Under Five: A Scoping Review. *Jurnal Berita Ilmu Keperawatan*, 18(1), 138–147. <https://doi.org/10.23917/bik.v18i1.6192>
- Anita, F., Kana, M., & Nurmaisa Biduri, E. (2025). Empowerment of health cadres in early detection and family-based stunting prevention. *Jurnal Pengabdian Masyarakat Edukasi Indonesia*, 2(3), 121–127. <https://doi.org/10.61099/jpmei.v2i3.127>
- Azza, A., A. Sasarari, Z., Komariah Sambas, E., & Muzfah, A. W. (2025). Impact of nursing interventions on the implementation of primary health care policies: A Systematic Review. *Jurnal Edukasi Ilmiah Kesehatan*, 3(3), 95–104. <https://doi.org/10.61099/junedik.v3i3.144>
- Buanasita, A., Sumarmi, S., & Redjeki, K. S. (2025). Factors Affecting Adherence of Multiple-micronutrient Supplement Consumption Among Pregnant Mothers in Surabaya, East Java, Indonesia. *Malaysian Journal of Medicine & Health Sciences*, 21. <https://doi.org/10.47836/mjmhs.21.s7.17>
- Hulaila, A., Shaluhiah, Z., & Winarni, S. (2023). A Qualitative Study on Adolescents Lifestyles Related to Stunting Prevention. *Public Health Sciences*, 38(1), 55.
- Jaisamrarn, U., Esteban-Habana, M. A., Padolina, C. S., Decena, D. C. D., Dee, M. T., Damodaran, P., Bhaskaran, V., Garg, V., Dorado, E., & Hu, H. (2023). Vitamins and minerals, education, and self-care need during preconception to 1000 days of life in Southeast Asia: An expert panel opinion. *SAGE Open Medicine*, 11,

20503121231173376. <https://doi.org/10.1177/20503121231173377>
- Laksmi Puspa Sari, G. A. P., Ari Kusuma Yana, I. G. A., & Irawati Wibowo, Y. (2025). The Impact of Nutrition Education Intervention on Parental Knowledge to Prevent Child Stunting. *Journal Syifa Sciences and Clinical Research*, 7(2), 98–103. <https://doi.org/10.37311/jsscr.v7i2.30531>
- Mohsen, H., Ibrahim, C., Bookari, K., Saadeh, D., Al-Jawaldeh, A., Sacre, Y., Hanna-Wakim, L., Al-Jaafari, M., Atwi, M., AlAsmar, S., Najem, J., & Hoteit, M. (2022). Prevalence of Essential Nutrient Supplement Use and Assessment of the Knowledge and Attitudes of Lebanese Mothers towards Dietary Supplement Practices in Maternal, Infancy and Preschool Ages: Findings of a National Representative Cross-Sectional Study. *Foods*, 11(19), 3005. <https://doi.org/10.3390/foods11193005>
- Nnamani, J. E., Agu, U. F., Okafor, B. C., Aransiola, M. M., Ezeamii, J. C., Benson, O. C., Appiah, L., & Nwokedi, V. U. (2025). A Review on Micronutrient Malnutrition in Pregnant Women and Children Under Five Years. *Journal of Pharma Insights and Research*, 3(3), 304–316. <https://doi.org/10.69613/kjd00396>
- Nofitasari, A., Israeli, I., & Dina, H. (2025). Stunting Countermeasures Model (A Case Study of a Specific Nutrition Intervention Program). *Journal of Public Health and Pharmacy*, 5(2), 417–430. <https://doi.org/10.56338/jphp.v5i2.6373>
- Rahmawati, W., van der Pligt, P., Worsley, A., & Willcox, J. C. (2021). Indonesian antenatal nutrition education: A qualitative study of healthcare professional views. *Women's Health*, 17, 174550652110660. <https://doi.org/10.1177/17455065211066077>
- Sada, K., Zakaria, Z., & Rifai, M. (2025). Risk factors associated with stunting among toddlers aged 24–59 months: A Case-Control. *Jurnal Ilmiah Kesehatan Sandi Husada*, 14(2), 221–230. <https://doi.org/10.35816/jiskh.v14i2.1276>
- Schoeman, N. (2025). Oral nutritional supplementation in paediatric feeding difficulties: a South African pharmacist's evidence-based review. *SA Pharmaceutical Journal*, 92(3), 27–30. <https://doi.org/10.36303/SAPJ.2842>
- Septi Fandinata, S., Mas Ulfa, N., Puspa Novita, R., & Aryanda Putra, D. (2024). Evaluation of the Adequacy Level of Nutritional Substances (Vitamins) with the Incident of Stunting in Children in the Working Area of the Surabaya City Health Center. *International Journal of Science, Technology & Management*, 5(2), 431–439. <https://doi.org/10.46729/ijstm.v5i2.1079>
- Singla, N., Jindal, A., & Mahapatra, D. K. (2023). Role of Pharmacist in Nutrition Management-The Unexplored Path. *Indian Journal of Pharmacy Practice*, 16(2), 83–88. <https://doi.org/10.5530/ijopp.16.2.14>
- Sun, Y., Ma, J., Wei, X., Dong, J., Wu, S., & Huang, Y. (2023). Barriers to and Facilitators of the Implementation of a Micronutrient Powder Program for Children: A Systematic Review Based on the Consolidated Framework for Implementation Research. *Nutrients*, 15(24), 5073. <https://doi.org/10.3390/nu15245073>
- Suprpto, S., Arda, D., Kurni Menga, M., Adji Saktiawan, B., & Nggaá Woge, S. (2025). OPTIMALCARE: Community-based homecare policy innovation in accelerating stunting reduction in Makassar City. *Abdimas Polsaka*, 4(2), 148–156. <https://doi.org/10.35816/abdimaspolsaka.v4i2.107>
- Suprpto, S., Arda, D., Tri Wijayanti, Y., & Fredy Saputra, M. K. (2025). Providing education for the community to improve nutrition for toddlers. *Abdimas Polsaka*, 4(1), 22–29. <https://doi.org/10.35816/abdimaspolsaka.v4i1.40>
- Sylvia Bawilin, N., & Suprpto, S. (2025). Influence of social media influencers on adolescents' confidence and emotions in health education. *Jurnal Edukasi Ilmiah Kesehatan*, 3(3), 87–94. <https://doi.org/10.61099/junedik.v3i3.143>