



# The Potential of Plantain Leaves (*Plantago major* L) and Turmeric Rhizome (*Curcuma longa* L) in Perineal Wound Healing

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| Track Record Article                                                                                                                                                                                                                                                                                                                                                                                                         | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <p>Revised: 10 May 2026<br/>Accepted: 14 September 2026<br/>Published: 27 September 2026</p> <p><b>How to cite :</b><br/>Simbolon, J. L., Sitompul, E. S., &amp; Tampubolon, A. (2026). The Potential of Plantain Leaves (<i>Plantago major</i> L) and Turmeric Rhizome (<i>Curcuma longa</i> L) in Perineal Wound Healing. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 8(3), 156–164.</p> | <p><i>Women giving birth vaginally are at risk of perineal tears. The perineal area is often overlooked, with wound infection rates of 0.1–23.6%. Its warm, moist environment near genitourinary and gastrointestinal flora impairs healing. Poor care may cause infection, dyspareunia, reduced quality of life, or death. Midwives need safe, non-pharmacological, traditional methods to accelerate healing. To evaluate the effect of a combined decoction of <i>Plantago major</i> L. and <i>Curcuma longa</i> L. on perineal wound healing time. A quasi-experimental post-test-only control group design included 34 postpartum mothers (n=34; mean age 26.4±3.2 years, gestational age 38–40 weeks) with first- or second-degree perineal tears. The intervention group (n=17) received perineal compresses with the decoction; controls (n=17) received boiled and cooled water. Healing was assessed daily using the REEDA Scale (Redness, Edema, Ecchymosis, Discharge, Approximation). Mean healing time in the intervention group was 5.5 days (SD ±0.72; median 5 days; 95% CI: 5.18–5.82) vs. 6.7 days (SD ±0.44; median 7 days; 95% CI: 6.51–6.89) in controls. The Mann–Whitney test showed a significant difference (p &lt; 0.001). The combination of <i>Plantago major</i> L. and <i>Curcuma longa</i> L. is more effective than boiled water alone. Practical implications: This low-cost traditional decoction can be integrated into primary healthcare and community midwifery care to accelerate perineal wound healing, reduce complications, and improve maternal quality of life.</i></p> <p><b>Keywords:</b> <i>Plantago Major L, Curcuma Longa, Perineal Wound, Healing</i></p> |

## INTRODUCTION

Perineal trauma, either spontaneous or following episiotomy, frequently complicates vaginal delivery. This condition is particularly common among primiparous mothers and, if improperly managed, can significantly impair postpartum recovery (Cakwira et al., 2022; Faden et al., 2022; Khasanah et al., 2022). Globally, an estimated 2.7 million cases of perineal rupture were reported in 2020, with projections rising to 6.3 million by 2050. Regional prevalence varies considerably: approximately 50% in Asia, 85% in the United Kingdom, and 75% in Indonesia. Among 1,951 spontaneous vaginal deliveries in Indonesia, 57% required perineal suturing comprising 28% episiotomies and 29% spontaneous lacerations (Okeahialam et al., 2021). Postpartum perineal wounds may lead to serious complications, including infection, dehiscence, hypergranulation, perineal pain, and dyspareunia (Sukamti & Noviani, 2024). Standard perineal wound management includes proper suturing technique, analgesics, antibiotics, cryotherapy, and complementary therapies. Wound healing is influenced by age,

nutrition, personal hygiene, and early mobilization; inappropriate care delays healing and increases infection risk (Anggraini, 2021; Khatimah & Saleh, 2022).

Beyond clinical consequences, perineal infections impose a substantial economic burden on healthcare systems and affected individuals. Prolonged healing increases the need for repeated outpatient visits, additional medications, and wound care supplies, while also contributing to lost productivity and maternal absenteeism from infant care. In low-resource settings, including many rural areas of Indonesia, inequitable access to commercial antiseptics and antibiotics further exacerbates disparities in perineal wound outcomes. The use of locally available medicinal plants offers a potential strategy to address these access barriers, providing affordable, culturally acceptable alternatives that reduce dependence on costly pharmaceuticals (Okeahialam et al., 2024; Kaewsrising et al., 2021; Fuloria et al., 2022). Health workers can provide perineal wound care through both pharmacological and non-pharmacological approaches, including traditional methods (Fratidhina et al., 2023). Indonesia possesses rich biodiversity. Two native plants plantain leaf (*Plantago major* L.) and turmeric rhizome (*Curcuma longa* Linn.) have demonstrated therapeutic potential. Both contain bioactive compounds with anti-inflammatory, analgesic, antioxidant, immunomodulatory, anti-ulcer, and antibacterial activities that contribute to tissue healing. Aqueous extracts from these plants have shown inhibitory effects on hyaluronidase, collagenase, and elastase enzymes associated with wound development and delayed healing (Genc et al., 2020; Samuelson, 2000; Suprihatin et al., 2020; Hafanda et al., 2024). Additionally, these compounds exhibit antioxidant and antiviral properties that further support the wound healing process (Dewi et al., 2019). Topical gel preparations of plantain leaf extract have accelerated healing of second-degree burns, while turmeric rhizome has proven effective in healing incision wounds (Syarifuddin & Amalia, 2021; Anggreni et al., 2024).

The combination of *Plantago major* and turmeric is hypothesized to provide superior (synergistic) biological effects compared with single-agent use. This synergy is grounded in complementary mechanisms of action: plantain leaf is rich in aucubin and baicalein, which directly inhibit bacterial growth and reduce oxidative stress, while turmeric's curcuminoids suppress nuclear factor-kappa B (NF- $\kappa$ B) signaling, potentially downregulating pro-inflammatory cytokines (IL-1 $\beta$ , IL-6, TNF- $\alpha$ ). Simultaneously, curcumin enhances tissue granulation and collagen deposition by upregulating transforming growth factor-beta (TGF- $\beta$ ) and vascular endothelial growth factor (VEGF). By targeting distinct but overlapping pathways antibacterial, anti-inflammatory, and proliferative the dual extract is expected to produce a more rapid and complete healing response than either agent alone (Sinabariba, 2022). A

preliminary study has shown that a nanoemulgel formulation combining both extracts increases the zone of inhibition against *Staphylococcus aureus*, a common perineal pathogen, compared to individual extracts (Sinabariba, 2022). Midwives play a pivotal role in preventing perineal wound infections by providing education on proper care, supervising the wound-healing process, and promoting the safe use of natural materials for postpartum mothers.

This study aims to compare a combined decoction of *Plantago major* L. and turmeric rhizome versus boiled water (control) on perineal wound healing time among postpartum mothers with perineal trauma (Mutia et al., 2021). The population includes postpartum mothers with spontaneous vaginal delivery-related perineal trauma (Haesler, 2022). The intervention is daily perineal cleansing with the combined decoction, while the comparator uses boiled water alone. The primary outcome is healing time assessed by the REEDA scale (Redness, Edema, Ecchymosis, Discharge, Approximation). The null hypothesis ( $H_0$ ) states no significant difference in healing time between groups, while the alternative ( $H_1$ ) states the herbal decoction significantly reduces healing time compared to boiled water (Chow et al., 2023). Secondary objectives include evaluating participant compliance (frequency and correct technique) and assessing cultural acceptability of the intervention using a brief structured questionnaire.

## METHOD

A quasi-experimental study with a post-test control group design was conducted to compare perineal wound healing duration among postpartum mothers receiving a decoction of plantain leaves and turmeric rhizome. The research took place at five community health centers (Puskesmas): Hutabaginda, Siatas Barita, Siborong-borong, Sitada-data, and Onan Hasang, from June to September 2025 in North Tapanuli Regency. Postpartum mothers with perineal wounds constituted the study population, with a total sample of 34 participants consisting of 17 participants in the treatment arm and 17 in the control arm. The inclusion criteria were postpartum mothers who were willing to participate and had grade 1–2 perineal wounds resulting from either episiotomy or spontaneous rupture respondents in the treatment group and 17 in the control group. Exclusion criteria included postpartum mothers who were unwilling to participate, had a risk of infection or bleeding, showed hypersensitivity reactions to plantain leaves or turmeric rhizome, or had a body temperature above 37.5°C.

This case report was prepared in accordance with the Research Guidelines of the Medan Public Health Polytechnic (Poltekkes Kemenkes Medan) and has received written approval for publication. Ethical approval was obtained from the Health Research Ethics Committee of the

Medan Public Health Polytechnic (Poltekkes Kemenkes Medan) under ethical approval number No. 01.26.2905/KEPK/POLTEKKES KEMENKES MEDAN 2026.

Ingredients: 10 g of plantain leaves, 100 ml of clean water. To prepare, select fresh or dried healthy plantain leaves, wash them thoroughly, then chop them finely according to the desired consistency. Place the chopped leaves into an infusion pot and add 100 ml of water. Heat over an open flame for 15 minutes at a temperature of 90°C. After heating, strain the infusion through a flannel cloth while still warm, discarding the residue. If the volume is less than 100 mL, add hot water through the residue to reach the required volume (R. Y. Sinaga et al., 2020).

The procedure begins with the selection of fresh turmeric rhizomes, which are then thoroughly washed. The rhizome is weighed at 10 g, subsequently chopped into small pieces to obtain a homogeneous particle size. The chopped rhizome is placed into an infusion pot, and 100 mL of water is added. The mixture is heated over an open flame until it reaches a temperature of 100°C, followed by continued heating for 30 minutes (Kasemwattanakot et al., 2024). After this time has elapsed, the decoction is strained while still warm using a flannel cloth to separate the residue. If the filtrate volume is less than 100 mL, hot water is poured through the residue to reach the desired volume. Mixing: Combine the plantain leaf infusion and turmeric rhizome decoction thoroughly.

The intervention was conducted for six consecutive days. Subjects in the treatment group used filtered decoction water to clean the perineal wound thoroughly 2-3 times daily until the wound healed. Subjects in the control group cleaned the perineal wound three times a day with boiled clean water until the wound healed. If there were any allergic reactions or irritation, use should be discontinued, and consultation with medical personnel was advised. The variables in this study are a decoction of plantain leaves, turmeric rhizomes, and boiled water, which were used to clean the perineal wound regularly 2-3 times daily for six consecutive days. The duration of healing for perineal wounds graded 1-2 in postpartum mothers, whether due to episiotomy or spontaneous rupture, was measured using the REEDA scale.

The instrument used was an observation sheet to record the use of the decoction of plantain leaves, turmeric rhizome, and boiled water. Wound healing was monitored and documented on the observation sheet. A t-test was applied to determine differences in healing time between participants treated with a boiled extract of plantain leaves and turmeric rhizome and those given boiled, cooled water.

## RESULTS

**Table 1. The characteristics of the respondents include age, parity, and occupation (n=17)**

| Characteristics   | Treatment  | Control    |
|-------------------|------------|------------|
| <b>Age</b>        |            |            |
| < 20 years        | 1 (5,9%)   | 3 (17,6%)  |
| 25-35 years       | 13 (76,5%) | 5 (29,4%)  |
| > 35 years        | 3 (17,6%)  | 9 (53%)    |
| <b>Parity</b>     |            |            |
| 1-2               | 8 (47,1%)  | 9 (52,9%)  |
| > 2               | 9 (52,9%)  | 8 (47,1%)  |
| <b>Occupation</b> |            |            |
| Employed          | 5 (29.4%)  | 6 (35.3%)  |
| Unemployed        | 12 (70.6%) | 11 (64.7%) |

Participant characteristics included age, parity, and occupation, obtained from questionnaire data. Table 1 presents the distribution of characteristics based on maternal age, showing that most participants were aged 20–35 years, with 13 individuals (76.5%) in the intervention arm and 9 (53%) in the control arm. Regarding parity, the majority in the intervention arm were multiparous (>2 children), accounting for 9 participants (52.9%), while in the control arm, most had 1–2 children, also totaling 9 participants (52.9%). In terms of occupation, most participants were unemployed, with 12 individuals (70.6%) in the intervention arm and 11 (64.7%) in the control arm.

Normality testing showed that data in both groups were not normally distributed ( $p < 0.05$ , Shapiro–Wilk). Despite a non-significant Kolmogorov–Smirnov result in the control group, the Shapiro–Wilk test confirmed non-normality. Thus, non-parametric tests were used for subsequent analysis.

**Table 2. The Effect of Boiled Plantain Leaf, Turmeric Rhizome, and Boiled Water On Perineal Wound Healing (n=17)**

| Luka Perineum | Kelompok   |            | <i>p value</i> | Cohens'd |
|---------------|------------|------------|----------------|----------|
|               | Intervensi | Kontrol    |                |          |
| Mean ± SD     | 5.53± 0.72 | 6.76± 0.44 | <0,001         | 2.13     |
| Median        | 5          | 7          |                |          |

The results presented in Table 3 show that the mean healing time in the intervention group was  $5.53 \pm 0.72$  days (median: 5 days), whereas in the control group it was  $6.76 \pm 0.44$  days (median: 7 days). The Mann-Whitney test yielded a  $p$ -value of  $< 0.001$ , indicating a statistically significant difference between the two groups. These findings suggest that the plantain leaf intervention significantly accelerates perineal wound healing in postpartum mothers compared to the control. Furthermore, the combined application of plantain leaves and turmeric rhizome was found to be effective in promoting healing of first- and second-degree

perineal wounds. During the 6-day intervention period, no participants dropped out, no allergic reactions were reported, and all participants adhered to the prescribed regimen.

## DISCUSSION

The combined decoction of plantain leaves (*Plantago major* L.) and turmeric rhizome (*Curcuma longa* Linn.) significantly accelerates perineal wound healing among postpartum mothers (Ghanadian et al., 2024). This aligns with previous research: a 10% topical *Plantago major* gel accelerated healing in diabetic foot ulcers and pressure sores, and *Plantago major* syrup reduced radiation-induced mucositis. Keshavarzi et al. (2022) reported that 10% *Plantago major* ointment accelerates wound closure and reduces pain with a safe topical profile. These anti-inflammatory, analgesic, and antimicrobial activities support *Plantago major*'s role in perineal repair (Keshavarzi et al., 2022).

Turmeric infusion promotes healing of grade 2 perineal wounds. Wound healing involves coagulation, inflammation, proliferation, and remodelling. Curcumin reduces TNF- $\alpha$  and IL-1 expression while restoring ROS/antioxidant balance, leading to decreased redness, oedema, faster epithelialization, and enhanced collagen synthesis (Mutia et al., 2021). *In vivo* studies confirm topical curcumin downregulates TNF- $\alpha$  and IL-6, and *in vitro* data show dose-dependent free radical scavenging.

Local knowledge of medicinal plants in North Tapanuli is still preserved, although it has not yet been fully scientifically validated. Turmeric rhizome has been widely known for perineal wound care (A. H. Sinaga & Manalu, 2021), whereas plantain leaf (*Plantago major* L.) remains underutilised due to limited knowledge and scientific evidence. The combination of these two plants integrates local wisdom with an evidence-based approach in modern midwifery practice.

Compared to 10% povidone-iodine, the decoction of plantain leaves and turmeric is more suitable for resource-limited settings. Plantain leaf exhibits antioxidant, antimicrobial, and tissue regeneration effects, while Curcumin in turmeric has proven anti-inflammatory and antioxidant activity through the reduction of TNF- $\alpha$ . Povidone-iodine may cause local irritation and delayed granulation (Khan et al., 2023), with a cost of approximately IDR 5,000–10,000 per day. In contrast, both plants are readily available and easily processed. Several studies indicate that turmeric provides comparable or faster epithelialization than povidone-iodine with fewer adverse effects (Haesler, 2022), making it a potentially more time- and cost-efficient alternative.

A strength of this study is that it is one of the first to evaluate a locally derived wisdom-based decoction of plantain leaves and turmeric for perineal wound healing in community health centres of North Tapanuli Regency. However, limitations include the small sample size (n=34), home-based self-assessment of wound healing, and potential variability in decoction preparation. Therefore, future research with larger samples, a randomised controlled trial design, and a cream formulation combining plantain leaves and turmeric rhizome is required.

## CONCLUSION

The combination of plantain leaf and turmeric rhizome is more effective than boiled and cooled water for healing perineal wounds, with clinical benefits including accelerated wound closure, reduced inflammation, and minimal adverse effects. Economically, this intervention represents a cost-effective alternative for primary healthcare facilities (*Puskesmas*) with limited resources. Therefore, it may be considered for integration into the Standard Operating Procedures (SOP) for midwifery care for postpartum mothers with first- and second-degree perineal wounds. Further research in the form of a multicentre randomised controlled trial (RCT) with a double-blind design is needed to strengthen the scientific evidence, confirm these findings, and improve external validity.

## REFERENCES

- Anggraini, Y. (2021). Can traditional medicine aloe vera heal perineum treatment in postpartum? *Turkish Journal of Physiotherapy and Rehabilitation*, 32(2), 2694–2699.
- Anggreni, N., Maghfirah, R., Bachri, M. S., & Mahdi, N. (2024). Pengaruh pemberian subkronis minyak atsiri rimpang kunyit (*Curcuma longa* Linn.) terhadap aktivitas SGPT dan SGOT serum tikus Sprague-Dawley. *JCPS (Journal of Current Pharmaceutical Sciences)*, 8(1), 743–748. <https://doi.org/10.35747/jcps.v8i1.1542>
- Cakwira, H., Mukengere, M., Lucien, B., Aborode, A. T., Sironge, L., Michael, M. V., & Akilimali, A. (2022). The clinical characteristics of perineal tears: A study carried out on 14 pregnant women in a tertiary center: Case series. *Annals of Medicine & Surgery*, 82, 104432. <https://doi.org/10.1016/j.amsu.2022.104432>
- Chow, J. C., Rajagopal, M., & Por, C. S. (2023). Herbs with acute wound healing potential: A review. *Current Trends in Biotechnology and Pharmacy*, 17(4), 1506–1517. <https://doi.org/10.5530/ctbp.2023.4.84>
- Dewi, K. T. A., Kartini, Sukweenadhi, J., & Avanti, C. (2019). Karakter fisik dan aktivitas antibakteri nanopartikel perak hasil green synthesis menggunakan ekstrak air daun sendok (*Plantago major* L.). *Pharmaceutical Sciences and Research*, 6(2), 69–81. <https://doi.org/10.7454/psr.v6i2.4220>
- Faden, Y. A., Fatani, A. M., Fallatah, B. M., Rawa, T. S., Almasri, S. A., El Amin, N. O., Rawas, S. A., & Al-Hindi, M. Y. (2022). Examining the association between episiotomy and severe perineal tears in a tertiary care center implementing a restrictive episiotomy policy. *Cureus*, 14(11), e31606. <https://doi.org/10.7759/cureus.31606>

- Fratidhina, Y., Mulyati, S., Astri, H., & Maximus, S. (2023). Analysis of red betel leaf tests as a natural anti-infection in post partum mothers. *Women, Midwives and Midwifery*, 3(1), 35–44. <https://doi.org/10.36749/wmm.3.1.35-44.2023>
- Fuloria, S., Mehta, J., Chandel, A., Sekar, M., Rani, N. N. I. M., Begum, M. Y., Subramaniyan, V., Chidambaram, K., Thangavelu, L., Nordin, R., Wu, Y. S., Sathasivam, K. V., Lum, P. T., Meenakshi, D. U., Kumarasamy, V., Azad, A. K., & Fuloria, N. K. (2022). A comprehensive review on the therapeutic potential of *Curcuma longa* Linn. in relation to its major active constituent curcumin. *Frontiers in Pharmacology*, 13, 820806. <https://doi.org/10.3389/fphar.2022.820806>
- Genc, Y., Dereli, F. T. G., Saracoglu, I., & Akkol, E. K. (2020). The inhibitory effects of isolated constituents from *Plantago major* subsp. *major* L. on collagenase, elastase and hyaluronidase enzymes: Potential wound healer. *Saudi Pharmaceutical Journal*, 28(1), 101–106. <https://doi.org/10.1016/j.jsps.2019.11.011>
- Ghanadian, M., Soltani, R., Homayouni, A., Khorvash, F., Jouabadi, S. M., & Abdollahzadeh, M. (2024). The effect of *Plantago major* hydroalcoholic extract on the healing of diabetic foot and pressure ulcers: A randomized open-label controlled clinical trial. *The International Journal of Lower Extremity Wounds*, 23(3), 475–481. <https://doi.org/10.1177/15347346211070723>
- Haesler, E. (2022). WHAM evidence summary: Topical turmeric for wound healing. *WCET Journal*, 42(3), 38–41. <https://doi.org/10.33235/wcet.42.3.38-41>
- Hafanda, C. R., Alfitri, R., & Widiatrilupi, R. M. V. (2024). Pengaruh kunyit asam terhadap penyembuhan luka perineum derajat 2 pada ibu post partum hari ke-1 di Gondanglegi Kabupaten Malang. *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*, 15(1), 260–267. <https://doi.org/10.34305/jikbh.v15i01.1029>
- Kaewsrising, S., Sukpat, S., Issarasena, N., Patumraj, S., & Somboonwong, J. (2021). The effects of oral Aloe vera on the efficacy of transplanted human endothelial cells and the expression of matrix metalloproteinases in diabetic wound healing. *Heliyon*, 7(12), e08533. <https://doi.org/10.1016/j.heliyon.2021.e08533>
- Kasemwattananrot, P., Kunthakudee, N., Chutvirasakul, B., & Ramakul, P. (2024). Curcuminoid extraction from rhizomes of *Curcuma longa* via aqueous two phases system. *Chemical Engineering Communications*, 211(4), 492–509. <https://doi.org/10.1080/00986445.2023.2253159>
- Keshavarzi, A., Montaseri, H., Akrami, R., Moradi Sarvestani, H., Khosravi, F., Foolad, S., Zardosht, M., Zareie, S., Saharkhiz, M. J., & Shahriarirad, R. (2022). Therapeutic efficacy of Great Plantain (*Plantago major* L) in the treatment of second-degree burn wounds: A case-control study. *International Journal of Clinical Practice*, 2022(1), 1–7. <https://doi.org/10.1155/2022/4923277>
- Khan, M. A. O., Ramadugu, R., Suvvari, T. K., Vijayalakshmi, M., & Thomas, V. (2023). Irritant contact dermatitis due to povidone-iodine following a surgical intervention: An unusual case report. *SAGE Open Medical Case Reports*, 11, 10–12. <https://doi.org/10.1177/2050313X231185620>
- Khasanah, Y. Y., Early, A. Y. R., & Saputri, W. A. (2022). The relationship between knowledge of postpartum mothers about perineal wound treatment with perineal wound healing. *Indonesian Health Journal*, 1(1), 7–12. <https://doi.org/10.58344/ihj.v1i1.9>
- Khatimah, H., & Saleh, S. N. H. (2022). Faktor-faktor yang berhubungan dengan penyembuhan luka perineum pada ibu nifas di Puskesmas Batua Kota Makassar. *Promotif: Jurnal Kesehatan Masyarakat*, 12(1), 95–101. <https://doi.org/10.56338/pjkm.v12i1.2478>
- Mutia, W. O. N., Usman, A. N., Jaqin, N., Prihantono, Rahman, L., & Ahmad, M. (2021). Potency of complemeter therapy to the healing process of perineal wound; turmeric

- (*Curcuma longa* Linn) infusa. *Gaceta Sanitaria*, 35(2), S322–S326. <https://doi.org/10.1016/j.gaceta.2021.10.045>
- Okeahialam, N. A., Sultan, A. H., & Thakar, R. (2024). The prevention of perineal trauma during vaginal birth. *American Journal of Obstetrics and Gynecology*, 230(3), S991–S1004. <https://doi.org/10.1016/j.ajog.2022.06.021>
- Okeahialam, N. A., Thakar, R., & Sultan, A. H. (2021). Healing of disrupted perineal wounds after vaginal delivery: A poorly understood condition. *British Journal of Nursing*, 30(Sup20), S8–S16. <https://doi.org/10.12968/bjon.2021.30.Sup20.S8>
- Samuelsen, A. B. (2000). The traditional uses, chemical constituents and biological activities of *Plantago major* L. A review. *Journal of Ethnopharmacology*, 71(1–2), 1–21. [https://doi.org/10.1016/S0378-8741\(00\)00212-9](https://doi.org/10.1016/S0378-8741(00)00212-9)
- Sinabariba, C. M. (2022). *Formulasi dan karakterisasi sediaan nanoemulgel dari kombinasi ekstrak daun sendok (Plantago major L.) dan rimpang kunyit (Curcuma longa L.) sebagai sediaan topikal pada penyembuhan luka* [Doctoral dissertation, Universitas Sumatera Utara]. <https://repositori.usu.ac.id/handle/123456789/47321>
- Sinaga, A. H., & Manalu, A. I. (2021). Kajian etnobotani dan bioaktifitas tumbuhan obat Kabupaten Tapanuli Utara. *JIFI (Jurnal Ilmiah Farmasi Imelda)*, 5(1), 21–25. <https://doi.org/10.52943/jifarmasi.v5i1.618>
- Sinaga, R. Y., Prasetyaningsih, A., & Prakasita, V. C. (2020). Potensi ekstrak daun sendok (*Plantago major* L.) dan serai (*Cymbopogon citratus* L.) sebagai feet sanitizer alami. *Prosiding Seminar Nasional Biologi*, 6(1), 270–277. <https://doi.org/10.24252/psb.v6i1.15864>
- Sukamti, S., & Noviani, V. A. (2024). Determinants of perineal wound healing in 2023. *Journal of Health Technology Assessment in Midwifery*, 7(1), 1–10. <https://doi.org/10.31101/jhtam.3131>
- Suprihatin, T., Rahayu, S., Rifa'i, M., & Widyarti, S. (2020). Senyawa pada serbuk rimpang kunyit (*Curcuma longa* L.) yang berpotensi sebagai antioksidan. *Buletin Anatomi Dan Fisiologi*, 5(1), 35–42. <https://doi.org/10.14710/baf.5.1.2020.35-42>
- Syarifuddin, A., & Amalia, R. (2021). Studi etnomedisin pada masyarakat 5 desa Kecamatan Secang Kabupaten Magelang. *Jurnal Ilmiah Ibnu Sina (JIIS): Ilmu Farmasi Dan Kesehatan*, 6(2), 368–378. <https://doi.org/10.36387/jiis.v6i2.747>