BIS HEALTH AND ENVIRONMENTAL SCIENCE

Volume 3 2026 | DOI: 10.31603/bishes.429
7th Borobudur International Symposium on Humanities and Social Science (BIS-HSS) 2025

UNIMMA PRESS
Universitas Muhammadiyah Magelang

Herbal-based complementary therapies in burn wound management: Evidence from a community-based study in Indonesia

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Abstract

Background: Burn injuries remain a major public health concern, particularly in low- and middle-income countries. Alongside conventional medical management, communities frequently employ herbal-based complementary therapies for minor burn wounds. However, empirical documentation of these practices at the community level remains limited. Objective: To describe the patterns, types, and practices of herbal-based complementary therapies used for burn wound management among residents of Krajan Hamlet, Indonesia. Methods: A community-based descriptive quantitative study was conducted involving 129 adult respondents selected through purposive sampling. Data were collected using a validated structured questionnaire covering sociodemographic characteristics, types of herbal remedies used, modes of application, and overall practice scores. Data were analyzed using descriptive statistics. Results: The majority of respondents demonstrated good practice in the use of herbal therapies for burn wound management (69.8%). Aloe vera was the most frequently utilized herbal remedy (37.4%), followed by Anredera cordifolia (binahong) (31.0%), Piper betle (green betel leaf) (26.4%), Piper crocatum (red betel leaf) (15.5%), and Kalanchoe pinnata (cocor bebek) (10.1%). Direct topical application was the predominant mode of use (71.3%). Conclusion: Herbal-based complementary therapies are widely and consistently practiced within the community, particularly for minor burn injuries. While these practices reflect strong local knowledge and accessibility, structured health education is required to ensure safe application, appropriate burn classification, and timely referral to professional medical care.

Published:
May 04, 2026

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Selection and Peer-review under the responsibility of the 7th BIS-HSS 2025 Committee

Introduction

Burn injuries remain a significant global health problem, contributing substantially to morbidity, mortality, prolonged hospitalization, and reduced quality of life. The World Health Organization estimates that approximately 180,000 burn-related deaths occur annually, with the vast majority affecting populations in low- and middle-income countries [1][2], [3]. In these settings, limited access to timely and adequate burn care

exacerbates the burden of injury, particularly for burns occurring in domestic environments.

In Indonesia, burn injuries continue to represent an important public health concern. National health data indicate that most burn incidents occur at home and are associated with daily activities such as cooking, agricultural work, and small-scale industrial labor [4]. Rural communities are especially vulnerable due to delayed access to health facilities, reliance on self-care, and strong adherence to traditional healing practices.

Clinically, burn wound management aims to control infection, reduce inflammation and pain, promote tissue regeneration, and prevent complications such as scarring or contractures [5]. Standard treatment protocols commonly include wound cleansing, topical antimicrobials such as silver sulfadiazine, analgesia, and appropriate dressings [6][7]. Although effective, these interventions may be associated with adverse effects, high costs, and the need for professional supervision, which can limit their accessibility in community settings.

As a result, complementary and alternative medicine, particularly herbal-based therapies, is widely used as a first-line or adjunctive approach for managing minor burns. Herbal remedies are often perceived as safer, more natural, culturally acceptable, affordable, and readily available. In Indonesia, medicinal plants such as Aloe vera, *Piper betle*, *Anredera cordifolia* (*binahong*), and *Kalanchoe pinnata* (*cocor bebek*) have long been utilized for wound care and burn treatment within families and communities [4], [8], [9].

Growing scientific evidence supports the biological plausibility of these practices. Experimental and clinical studies have demonstrated that Aloe vera possesses anti-inflammatory, antimicrobial, antioxidant, and re-epithelialization-promoting properties, while *binahong* and betel leaves contain flavonoids, saponins, and tannins that contribute to wound contraction and infection control [10]–[12]. Recent case reports and pilot studies conducted by Wahyuningtyas et al. further suggest that locally formulated herbal extracts, particularly when combined with honey-based preparations, may accelerate healing in superficial burn wounds [10][13].

Despite growing experimental and clinical evidence regarding the pharmacological potential of medicinal plants for burn treatment, important gaps remain in understanding how these remedies are actually used in real-world community settings. Existing literature predominantly focuses on laboratory studies, clinical trials, or case reports, with limited empirical data documenting community decision-making processes, preparation methods, safety practices, and adherence to burn first-aid principles. Consequently, there is insufficient evidence describing whether community-based herbal practices align with recommended clinical burn management standards or pose potential risks.

Addressing this gap is essential because community behavior represents the first line of response in most minor burn injuries, particularly in rural areas with limited access to

formal health services. Krajan Hamlet represents a setting where traditional herbal medicine remains deeply embedded in everyday health practices, yet these practices have not been systematically documented or evaluated.

Therefore, this study aims not only to describe patterns of herbal use but also to generate baseline epidemiological evidence regarding the quality of community practices. By providing structured documentation of types, preparation methods, and practice levels, this study contributes novel community-level data that can inform culturally sensitive education programs and the integration of safe traditional remedies into evidence-based burn management strategies.

Method

Study design and setting

A descriptive quantitative study was conducted in July 2025 in Krajan Hamlet, Indonesia. The study focused on adult residents with prior experience using herbal remedies for burn wound management.

Population and sample

The target population comprised 317 residents of Krajan Hamlet. A total of 129 respondents were recruited using purposive sampling based on predefined inclusion criteria: adults aged 20–69 years, permanent residency in the study area, physical and mental fitness, willingness to participate, and prior experience using herbal remedies for burn wounds. Individuals aged ≥70 years or unwilling to participate were excluded.

Instrument and data collection

The questionnaire comprised four sections, totaling 28 items: sociodemographic characteristics (8 items), types of herbal remedies used (6 items), preparation and application methods (8 items), and burn management practice behaviors (6 items). Practice behavior items were scored on a dichotomous scale (correct practice = 1; incorrect practice = 0), yielding a possible total score range of 0–6.

Practice levels were categorized based on percentage scores using predetermined criteria:

- Good practice = ≥75% correct responses (score 5–6)
- Moderate practice = 50–74% (score 3–4)
- Poor practice = <50% (score 0–2)

Content validity was evaluated by three wound-care experts using the Content Validity Index (CVI), yielding an overall CVI of 0.89. Reliability testing in a pilot sample of 30 respondents demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.82$).

Data analysis

Data were processed and analyzed using SPSS software. Descriptive (univariate) analysis was employed to generate frequencies and percentages for all study variables.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Faculty of Health Sciences, Universitas Muhammadiyah Magelang (No. 0319/KEPK-FIKES/II.3.A/UF/2025). Ethical principles of autonomy, beneficence, non-maleficence, justice, confidentiality, and data integrity were strictly observed.

Results

Respondent characteristics

A total of 129 respondents participated in this study. Table 1 presents the age distribution, showing that the majority were in the productive age group of 20–35 years (42.6%), followed by 36–45 years (31.0%). This distribution indicates a higher exposure of economically active individuals to burn risks.

Table 2 shows the gender distribution, with females accounting for 59.7% of respondents. Occupational distribution is presented in Table 3. Housewives constituted the largest group (46.5%), followed by farmers (21.7%) and private-sector workers (19.4%). Educational background is summarized in Table 4 indicating that nearly half of respondents had completed secondary education.

Table 1. Age distribution of respondents

Age Group (Years)	N	%
20–35	55	42.6
36–45	40	31.0
46–55	22	17.1
>55	12	9.3
Total	**129**	**100**

Table 2. Gender distribution of respondents

Gender	N	%
Male	52	40.3
Female	77	59.7
Total	**129**	**100**

Table 3. Occupational distribution of respondents

Occupation	N	%
Housewife	60	46.5
Farmer	28	21.7
Private/Self-employed	25	19.4
Civil servant	8	6.2
Others	8	6.2
Total	**129**	**100**

Table 4. Educational level of respondents

Education Level	N	%
Primary school	20	15.5
Junior high school	32	24.8
Senior high school	61	47.3
Diploma/Bachelor	16	12.4
Total	**129**	**100**

Types and application of herbal remedies

Table 5 summarizes the types of herbal remedies used for burn wound management. Respondents were allowed to select more than one option; therefore, the total exceeds the number of respondents. *Aloe vera* was the most frequently reported herbal remedy (37.4%). Table 6 presents the methods of herbal application. Direct topical application was the predominant practice (71.3%). Overall practice scores are presented in Table 7 indicating that most respondents demonstrated good practice in herbal burn management.

Table 5. Types of herbal remedies used for burn wounds

Herbal type	N	%
Aloe vera	48	37.4
Anredera cordifolia (binahong)	40	31.0
Piper betle (green)	34	26.4
Piper crocatum (red)	20	15.5
Kalanchoe pinnata	13	10.1
Others	5	3.9

Table 6. Methods of herbal application

Method of Application	N	%
Direct topical application	92	71.3
Boiled, used as compress	20	15.5
Boiled and consumed	10	7.8
Combination methods	7	5.4
Total	**129**	**100**

Table 7. Practice level of herbal-based burn management

Practice Category	N	%
Good	90	69.8
Moderate	30	23.3
Poor	9	7.0
Total	**129**	**100**

Discussion

While this study confirms the widespread use of herbal remedies for burn management, the findings should be interpreted within a broader clinical and safety framework. Although many respondents demonstrated good practice scores, this does not necessarily indicate adherence to evidence-based burn care standards. The discrepancy between community-perceived "good practice" and clinically appropriate burn management highlights a critical gap between experiential knowledge and professional guidelines.

From a clinical perspective, the use of non-standardized herbal preparations introduces variability in dosage, sterility, and phytochemical concentration. Such variability may influence therapeutic effectiveness and increase the risk of contamination or delayed epithelialization, particularly when applied to partial-thickness or deep burns [26], [27]. Experimental and systematic reviews demonstrate that herbal therapies can promote

healing under controlled conditions, but outcomes vary widely depending on formulation and preparation methods [20], [23], [29].

Importantly, reliance on home-based herbal treatment may delay referral to professional care for burns requiring medical intervention. Delayed presentation has been associated with increased infection risk, prolonged healing time, and poorer clinical outcomes [17]. Therefore, the critical issue is not whether herbal therapies are used, but whether they are used appropriately within the correct clinical context.

These findings suggest that community burn education programs should prioritize severity recognition and referral decision-making rather than discouraging traditional remedies altogether. Integrating culturally accepted herbal practices with standardized burn first-aid protocols may represent a more effective public health strategy than attempting to replace traditional practices with purely biomedical approaches [7].

Sociodemographic context and burn risk

The predominance of respondents in productive age groups highlights increased exposure to burn risks associated with household, agricultural, and informal occupational activities. The higher proportion of female respondents, particularly housewives, aligns with existing literature indicating that women are more frequently exposed to domestic burn hazards due to cooking and food preparation activities [14][15]. Moreover, women often serve as primary caregivers and decision-makers for home-based health interventions, including the selection and application of herbal remedies. Educational attainment at the secondary level among most respondents suggests adequate capacity to receive health information; however, it also underscores the persistence of traditional practices that may not always align with clinical guidelines [16][17].

Predominant herbal remedies and scientific plausibility

The dominant use of *Aloe vera* observed in this study is consistent with extensive experimental and clinical evidence supporting its role in burn wound healing [18]. Bioactive compounds in Aloe vera, including polysaccharides, glucomannan, vitamins, and enzymes, have been shown to reduce inflammation, enhance fibroblast proliferation, and accelerate re-epithelialization. Similarly, binahong (*Anredera cordifolia*) and betel leaves (*Piper betle and Piper crocatum*) are rich in flavonoids, saponins, and tannins that exert antimicrobial and anti-inflammatory effects, thereby reducing infection risk and promoting granulation tissue formation [19]–[21].

Recent clinical observations and case reports by Wahyuningtyas et al. further support the potential effectiveness of locally formulated herbal preparations, particularly when combined with honey-based products, in managing superficial second-degree burns [10]. These findings reinforce the biological plausibility of the community practices documented in this study and highlight the relevance of locally generated evidence in supporting traditional medicine [22]–[25].

Patterns of application and safety considerations

Direct topical application was the most frequently reported method of herbal use, reflecting the community's preference for immediate and practical interventions. While topical application of fresh herbal materials may be beneficial for clean, superficial burns, improper preparation techniques, lack of hygiene, and absence of dosage standardization pose significant safety concerns [26], [27]. Inappropriate use may lead to contamination, secondary infection, or delayed healing, particularly if applied to deeper or extensive burns [24].

The finding that a majority of respondents demonstrated good practice indicates substantial experiential knowledge; however, the presence of moderate and poor practice categories suggests gaps in understanding burn severity classification and referral criteria. This is consistent with previous community-based studies reporting delayed presentation to health facilities due to overreliance on traditional remedies [25], [28], [29].

Implications for community health and clinical practice

The results of this study underscore the importance of integrating culturally accepted herbal practices with evidence-based burn management guidelines. Rather than discouraging traditional medicine use, health professionals should adopt a culturally sensitive approach that promotes safe herbal application for minor burns while clearly defining warning signs and indications for immediate medical referral. Structured community education programs led by nurses and primary health care workers could play a pivotal role in bridging this gap.

Furthermore, these findings support the inclusion of complementary therapy education within community nursing curricula and continuing professional development. Establishing standardized, evidence-informed protocols for commonly used herbal remedies may enhance patient safety and optimize outcomes in resource-limited settings.

A key strength of this study lies in its community-based design, which provides real-world evidence reflecting actual first-aid practices rather than controlled clinical behavior. This enhances ecological validity and offers insights into culturally embedded treatment decisions that are rarely captured in clinical studies.

Study limitations and future directions

This study is limited by its descriptive design, which precludes causal inference and assessment of clinical effectiveness. Data were based on self-reported practices and did not include objective measurement of wound healing outcomes or complication rates. Future research should employ analytical, quasi-experimental, or randomized controlled designs to evaluate the efficacy, safety, and optimal formulations of specific herbal therapies. Incorporating microbiological and wound-healing indicators would further strengthen the evidence base.

Overall, this study contributes meaningful community-level evidence to the growing discourse on integrative burn care and provides a foundation for the development of safe, culturally grounded complementary therapy interventions.

Conclusion

This community-based study demonstrates that herbal-based complementary therapies are widely utilized for burn wound management in Krajan Hamlet, Indonesia, with the majority of respondents exhibiting good overall practice. Aloe vera, *binahong*, green and red betel leaves, and *cocor bebek* were identified as the most commonly used medicinal plants, predominantly applied through direct topical administration for minor burn injuries.

The findings highlight the strong role of local knowledge, cultural beliefs, and accessibility in shaping community responses to burn injuries. While the prevalent practices are generally appropriate for superficial burns, the absence of standardized preparation methods, dosage guidance, and clinical assessment underscores potential risks, including delayed referral and secondary infection.

These results emphasize the importance of integrating evidence-based burn care principles with culturally accepted herbal practices through structured community health education. Health professionals should actively engage communities in promoting safe first-aid measures, clear burn severity classification, and timely referral to health facilities for moderate to severe burns.

Future research is recommended to employ analytical and interventional study designs to evaluate the clinical effectiveness, safety, and optimal formulations of commonly used herbal remedies. Establishing standardized, evidence-informed guidelines for herbal-based burn management may contribute to improved community outcomes and support the integration of complementary therapies into primary health care frameworks.

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