

RESEARCH

Indigenous knowledge in diabetic foot ulcer management: a qualitative study among the Mandar tribe of West Sulawesi, Indonesia

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Abstract

Diabetic foot ulcers (DFUs) are serious diabetes complications that may lead to amputation if not properly managed. In West Sulawesi, the Mandar ethnic community continues to use traditional medicine for DFU treatment.

Objective This study explores local knowledge and traditional practices in DFU management among the Mandar ethnic group in West Sulawesi, Indonesia.

Methods A descriptive qualitative design with a phenomenological approach was applied. Eighteen participants with DFU experience who had used traditional treatments were recruited purposively. Data were collected through semi-structured online interviews and analysed thematically using MaxQDA. Relational patterns among ingredients, outcomes, and information sources were visualised using Gephi.

Results Turmeric was the most frequently used ingredient, followed by honey, guava leaves, coconut oil and castor leaves. Most materials were applied in raw, unstandardised forms. Some participants experienced positive early effects, while others reported worsening symptoms. Information was primarily transmitted through families and traditional figures. The network map revealed strong cultural and spiritual influences on treatment decisions.

Conclusion Traditional DFU care displays empirical understanding and cultural values, but its unregulated use poses scientific risks, highlighting the want for evidence-based, culturally-sensitive healthcare integration.

Keywords traditional medicine, diabetic foot ulcer, wound care, Mandar tribe, cultural health practices

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Introduction

Diabetic Foot Ulcer (DFU) represents one of the most severe and costly complications associated with Type 2 diabetes mellitus (T2DM). It is estimated that approximately 15–25% of individuals with T2DM will develop DFU during their lifetime, positioning it as a leading cause of diabetes-related hospitalisation and amputation.^{1,2} The elevated risks of infection, delayed wound healing, and potential limb loss render DFU a significant global health concern requiring urgent attention.^{3,4}

Despite extensive medical advances, the management of DFU remains particularly challenging in rural areas, such as

West Sulawesi (Indonesia), where access to formal healthcare services is often limited. In such contexts, traditional healing practices emerge as the primary treatment option for many local communities. The Mandar Tribe, indigenous to West Sulawesi Province, maintains a distinctive tradition of healing that incorporates natural remedies, including turmeric, guava leaves and honey, in the treatment of chronic wounds, such as DFU. The application of these ingredients is rooted not only in empirical knowledge but also in deep-seated social norms, familial influence and spiritual beliefs.^{5,6}

In addition to cultural and spiritual beliefs, the Mandar community's reliance on traditional medicine is strongly

influenced by its limited access to formal healthcare and economic constraints. Rural areas in Indonesia frequently face a scarcity of medical facilities and high treatment costs, making traditional remedies a more affordable and practical alternative.⁷ Moreover, the enduring heritage of indigenous healing practices provides these remedies with cultural legitimacy, reinforcing their use as generational knowledge embedded within local identity.⁸ Ethnomedicinal research in Indonesia also highlights that traditional wound care practices are preserved because they are perceived as safe, efficacious, and culturally relevant, with pharmacological evidence supporting their role in promoting tissue repair and healing.⁹ In line with this, an ethnographic study among Javanese diabetic patients demonstrated that medicinal plants and household remedies are commonly used, not only to manage blood glucose but also to treat wounds, reflecting a deeply-rooted cultural perception that traditional remedies are natural, safe, and spiritually aligned.¹⁰ Taken together, these findings indicate that the Mandar community's preference for traditional wound care is not only driven by limited healthcare access and economic constraints, but also by cultural legitimacy and a strong perception of safety and effectiveness embedded in local identity.

Although these traditional practices have long been established, scholarly attention to their sociocultural foundations remains scarce. This is consistent with the view that wound management in culturally diverse communities requires an understanding of local social beliefs and care-seeking behaviors.¹¹ Previous research has predominantly examined the pharmacological efficacy of traditional remedies, offering limited insight into the cultural interpretations and everyday applications of these healing methods.¹²

Understanding the cultural motivations and contextual meanings associated with traditional wound care practices is essential in developing effective and culturally congruent interventions. Therefore, this study aimed to explore and identify key themes emerging from participants' practices in using traditional materials for diabetic foot ulcer management in the Mandar ethnic community in West Sulawesi. The insights gained are expected to contribute to the development of more culturally-sensitive wound care strategies that are aligned with local values and health service realities.

Method

Study design

This study employed a descriptive qualitative design grounded in a phenomenological approach. This design was chosen to explore the Mandar experience of utilising traditional materials for DFU care in West Sulawesi Province. The phenomenological method was deemed appropriate, as it facilitates a subjective understanding of the meanings embedded in participants' lived experiences.¹³

Sampling technique

Participants were recruited using purposive sampling, guided by representation, to capture the diversity of experiences among Mandar communities utilising traditional ingredients for DFU treatment. Participants were recruited via a Google Form distributed through a WhatsApp group coordinated by wound care nurses and alumni of Bina Bangsa College of Health Sciences, Majene. These nurses also helped identify individuals who met the inclusion criteria and provided their contact information to the research team.

The selection process considered variations in traditional DFU care experience and demographic and clinical characteristics such as age, gender, education level, and wound condition. Inclusion criteria included individuals of Mandar ethnicity, aged 18 years or older, with a current or previous DFU and a history of using traditional medicine for wound care.

A total of 18 participants were enrolled, and sampling continued until thematic saturation was reached—the point at which no new themes emerged during the final interviews. This sample size is consistent with recommendations for phenomenological studies, which typically involve 10 to 20 participants to ensure depth and richness of data.

Researcher background and relationship with participants

The chief researcher, a master's level nurse affiliated with Hasanuddin University, conducted the interviews. This person had previous experience in qualitative research and had undergone specialised training in interview techniques. This background ensured ethical rigor and facilitated smooth data collection.

There was no pre-existing relationship between the researcher and the participants. Prior to participation, participants were fully informed that the purpose of the study was to understand the use of traditional medicine in the treatment of DFU. A clear explanation of the purpose of the study and participants' rights was given.

Data collection procedure

The researcher contacted eligible participants via phone or WhatsApp to explain the study, confirm eligibility, and obtain consent. Participants who agreed to participate completed a consent form prior to the interview.

In-depth, semi-structured interviews were conducted online using Zoom or WhatsApp, depending on participant preference and access. Each session was recorded with prior permission to ensure transparency and accuracy of data collection.

Instrument

The researcher (human instrument) was the main instrument in this study. To support the data collection process, a semi-structured interview guide, developed based on the research objectives, was used.

Data Analysis

Data was analysed using a thematic analysis approach. All interviews were transcribed verbatim using Turboscrib AI and subsequently manually verified for accuracy. The verbatim transcripts were coded and processed using MaxQDA version 24.8, where data units were classified into themes and/or subthemes. The coding process generated several codes or nodes representing key patterns and meanings derived from the participants' narratives. These codes were then mapped into a respondent-specific relational matrix to illustrate conceptual connections. The resulting matrix was further visualised and analysed using Gephi version 0.10 to explore the strength, interactions, and relational patterns among codes/nodes in the context of traditional repair practices in DFU management.

Results

This research was conducted in West Sulawesi Province, covering six districts: Polewali Mandar, Majene, Mamuju, Mamasa, Mamuju Tengah, and Pasangkayu. Based on a preliminary survey, 41 respondents were identified across the region: five from Polewali Mandar, six from Majene, seven from Mamuju, nine from Mamasa, five from Central Mamuju, and nine from Pasangkayu. However, only 18 respondents met the inclusion criteria and participated in the study as representatives of all districts in West Sulawesi Province. The remaining 23 were excluded for the following reasons: 10 did not respond, one was reported dead by the family, eight did not use traditional treatment for their wounds, and four did not admit to having a DFU.

Demographic and clinical characteristics of respondents

The study included 18 respondents, mostly female (77.78%) compared to male (22.22%), reflecting women's greater home wound care involvement. The mean age of the respondents was 48.78 years ($SD \pm 3.15$), with an age range of 32 to 85 years, indicating a higher prevalence of DFU among older people. Of the respondents, 55.56% reported wound healing, while 44.44% still had wounds, which may indicate delayed medical intervention or ineffectiveness of traditional treatment. Respondents came from six districts in West Sulawesi, with an equal distribution (16.67% per district), indicating that traditional medicine is a common practice in various Mandar communities, driven by limited access to formal health services (Table.1).

The relationship between traditional remedy practices and the management of DFU

Analysis of the matrix of traditional substance used in the management of DFU showed a strong community reliance on easily accessible natural substances with deep-rooted cultural values. Turmeric rhizome emerged as the most frequently mentioned ingredient, indicating its dominant role in home-based healing practices. Other frequently mentioned ingredients include honey, guava leaves, coconut oil and castor leaves. Usage patterns reflected a trend towards twice-daily use, highlighting the home-based wound

care routine. In terms of duration, most respondents reported using these substances for less than 10 days, followed by a smaller group who applied them for 11–20 days, indicating that self-medication is often initiated as a first-line response before seeking professional medical help. The matrix further shows that most substances are applied in raw form—either crushed, boiled, or directly applied to the body—without any standardisation or pharmaceutical processing. This choice reflects the perceived safety and independence associated with natural remedies. However, preparation methods, dosages, and application techniques are rarely documented, leading to significant variability in practice. These findings offer a comprehensive view of how local communities interpret traditional healing empirically and over generations. In addition, the findings underscore the importance of understanding patterns of use and preparation for developing more culturally-responsive and context-aware healthcare interventions (Table 2).

Relational mapping of the impacts of traditional therapies in the management of DFU

The matrix analysis of the use of traditional materials in the management of DFU shows the tendency of the community to rely on natural substances that are easily accessible and have strong traditional values. Turmeric rhizome emerged as the most frequently mentioned ingredient in the transcripts, highlighting its dominant role in home-based healing practices. Besides turmeric, informants frequently reported other ingredients such as honey, guava leaves, coconut oil, and castor leaves. Usage patterns showed a trend towards twice-daily use, reflecting a routine home-based wound

Table 1. Demographic and clinical characteristics of respondents

Respondent	Age	Gender	Outcome
PM01	44	Female	Healed
MN02	57	Female	Unhealed
PM03	49	Female	Unhealed
MT04	54	Male	Healed
MT05	41	Female	Healed
MT06	56	Female	Healed
MJ07	32	Female	Healed
MJ08	57	Female	Unhealed
PM09	45	Female	Unhealed
MN10	50	Female	Healed
MJ11	44	Male	Healed
MN12	47	Female	Healed
PK13	46	Female	Unhealed
MM14	52	Female	Healed
PK15	51	Female	Unhealed
PK16	80	Female	Unhealed
MM17	85	Male	Unhealed
MM18	52	Male	Healed

care approach. The duration of use varied; however, most respondents reported using the substance for less than 10 days, followed by a smaller group that used it for 11–20 days. This pattern suggests that self-medication is often used as a first step before seeking professional medical help. The matrix also shows that most ingredients are raw, such as ground, boiled, or applied directly to the product, without standardisation or pharmaceutical processing. This preference reflects the belief that ‘natural’ substances are inherently safe and can be prepared independently. However, mixing procedures, dosages, and application techniques are rarely documented in detail, leading to variability in practice. These findings provide a comprehensive picture of how traditional medicine is practiced empirically and over generations in communities and underscore the importance of understanding usage patterns and preparation methods to inform more context-sensitive and culturally responsive healthcare strategies (Table 3).

Visualisation of the network structure of traditional medicine use in the management of DFU

Analysis of the results using a network visualisation, generated with Gephi software, provided a more in-depth understanding of the relationship between traditional ingredient types, usage patterns, and outcomes in DFU management. In the network map, the node ‘Turmeric rhizome’ appears as a central point with significant size, indicating its high frequency and central role in traditional healing practices. This node is closely associated with usage patterns such as ‘2 times a day’ and duration ‘Less than 10 days,’ indicating that turmeric is used intensively in a short period, possibly due to the perception that it provides quick results. Besides turmeric, other ingredients such as honey, guava leaves, coconut oil and moringa leaves have formed distinct clusters, strongly associating with home-based treatment practices. The network also maps the information pathways that reinforce the use of these ingredients.

Table 2. Relational matrix related to the practice of using traditional materials in DFU management. The higher level of material usage is represented by a darker green color.

Theme	Code	Traditional material														
		Unknown	Honey	Lemongrass	Onion	Coconut oil	Coconut tumeric	Moringa tree root	Lannea coromandelica	Areca Nut	Guava leaves	Jatropha leaves	Lime	Tamarind	Sweet potato leaves	Tumeric rhizome
Source of information	Family		3	1	1	1			1	1	1	1			1	3
	Friends	1														2
	Neighbours		1									1				
	Shaman	2				1	1	1								
	Dreams												1	1		
Preparation	Raw material	1	3	1	1	2	1	1	1	1	1	2	1	1	1	5
	Powder	2														
Traditional material processing methods	Boil	1									1	1				
	Blend	1		1	1	2	1	1			1	1	1	1		1
	Mash					1				1		1				3
	Knead												1	1	1	
	Grate								1							1
Method of applying	Stick	2					1	1	1	1		1	1	1		2
	Soak										1	1				
	Apply		2													
Location of applying	Edge of wound		2						1			1			1	1
	Base of wound	1										1	1	1		1
Frequency of use	1-time use															1
	3 times a week										1	1				
	2 times a day		3						1			1	1	1	1	3
	More than 2 times a day	3				1			1							
Duration of use	Less than 10 days	2	1				1	1		1		1	1	1	1	1
	11–20 days		1								1	1				1
	More than 20 days		1						1							1

Nodes such as ‘Family’ and ‘Neighbour’ dominated as sources of knowledge, indicating that information is mainly transmitted through social and community channel, rather than from professional healthcare providers. Notably, the emergence of a large ‘Unknown’ node signifies the presence of ingredients that are used but cannot be scientifically identified, highlighting the vulnerability of empirical practices that lack a strong knowledge base. This visualisation reflects the relationship between ingredients and perceived effects and illustrates the social structures and belief systems that shape these practices. The presence of nodes such as ‘Shaman’ and ‘Dreams’ underscores the spiritual dimensions that legitimise the use of traditional remedies. Overall, the network visualisation offers a comprehensive picture of the traditional healing ecosystem, revealing a complex interplay between ingredients, duration, frequency, outcomes and the surrounding sociocultural context (Figure 1).

Discussion

Respondent characteristics

This study revealed female dominance among respondents, reflecting their primary role in wound care at home.

This finding aligns with previous studies highlighting the significant involvement of women in caregiving and chronic wound management in the family context.^{5,14} Furthermore, the higher prevalence of DFUs among older people is consistent with the literature showing an increased risk of wound complications due to reduced regenerative capacity and accumulation of comorbidities with age.^{1,2} This may also indicate a delay in seeking medical intervention or the ineffectiveness of traditional medicine used by some respondents. Integrating traditional medicine with formal health services to improve the effectiveness of care has been emphasised. This is in line with national wound care research priorities, which emphasise the need to recognise cultural values and informal systems of care when designing chronic wound interventions.¹⁵ However, there are contrasting findings; traditional medicine can provide adequate wound healing outcomes and accelerate recovery, if supported by appropriate education and clinical monitoring.¹⁶ This difference underscores that the effectiveness of traditional medicine is highly dependent on the cultural context and quality of care provided.

Table 3. Relational matrix of positive and negative impacts of traditional remedies in DFU management. The higher level of material usage is represented by a darker green color.

Code	Traditional material														
	Unknown	Honey	Lemongrass	Onion	Coconut oil	Coconut tumeric	Moringa tree root	Lannea coromandelica	Areca nut	Guava leaves	Jatropha leaves	Lime	Tamarind	Sweet potato leaves	Tumeric rhizome
Partial healing	1	2										1	1		
Comfort										1	1				1
Fast tissue growth		1													
Reduced swelling							1								
Reduced redness														1	
Swollen		1													
Itchy	1	1													
Pain	1							1							
No benefits															1
The wound did not heal								1	1						1
Wound condition worsens	2	1	1	1	2					1	2				3
Infection											1			1	2
Amputation	1					1	1								

in terms of patient empowerment, it also carries risks, especially if done without adequate information regarding dosage, drug interactions and potential toxicity.²⁴

In addition, most of the ingredients used in the respondents' traditional healing practices were prepared in raw form, such as pounded, boiled or applied directly. These practices reflect traditional herbal medicine use patterns that have persisted across communities for generations. Previous research has shown that communities often rely on raw materials due to ease of access, low cost, and trust in their effectiveness.^{24,25} WHO data also notes that approximately 80% of the global population uses plant-based medicines, many in non-standardised forms.²⁶ However, using raw materials poses potential problems, such as inconsistent dosing, unassured purity and risk of contamination. Without standardisation, variability in the active compound can affect therapeutic outcomes.²⁷ Public education must highlight the importance of formulation and standardisation processes to use local wisdom safely and effectively.

Interpretation and implications of traditional therapy impacts in DFU management

Analysis of our study revealed that most informants felt positive effects during the initial phase of using traditional remedies such as honey, coconut oil, and guava leaves in the treatment of DFU. This finding is consistent with several studies showing that honey can accelerate DFU wound healing, promote granulation tissue formation, and reduce pain.^{27,28} Similarly, the lauric acid and polyphenol content in coconut oil has been found to exhibit antimicrobial and anti-inflammatory activity, supporting tissue regeneration.²⁹ Guava leaf extract has also been shown to promote wound healing and inhibit the growth of pathogenic bacteria.^{29,30}

However, this treatment's effectiveness has proven inconsistent and short-lived. Some informants reported side effects such as swelling, increased pain, non-healing wounds, and even secondary infections leading to amputation. This suggests that using traditional medicine without medical supervision can be very risky. Previous studies have shown that self-medication with herbal remedies in DFU patients contributes to delays in seeking medical care and increases the risk of complications. Furthermore, side effects may be exacerbated by improper dosage, contamination, and unknown interactions with conventional treatments.^{31,32}

Our findings also highlight limitations in temporal documentation. Most informants did not report when negative effects started to appear, making it difficult to interpret the safe duration of traditional medicine use. This reflects weak record-keeping practices in the traditional medical system, which remains largely informal and poorly documented, as also emphasised by Chebii and colleagues.³³ The lack of systematic temporal data poses a significant barrier to integrating traditional medicine into the formal healthcare system.³⁴

On the other hand, belief in the benefits of natural substances is still strong among the public. These perceptions, shaped by cultural heritage, affordability, and personal experiences, include the notion that these substances are more "natural" and less likely to cause side effects.^{33,34} Even in the face of negative effects, many users continue to believe in the effectiveness of traditional medicine, which may result in delays in medical decision-making.³⁵ In this context, the literature suggests the need for educational interventions that bridge cultural beliefs with evidence-based medical practice.

Overall, the matrix results reinforce the urgency of formulating safer and more integrated traditional healing practices within the modern healthcare system. Evidence-based approaches, scientific validation, and cross-system collaboration are essential to ensure that proven herbal remedies can serve as effective complementary therapies.^{34,36} Public policies that promote interdisciplinary regulation, education and training are also needed to build a healthcare ecosystem that recognises traditional medicine without compromising patient safety.^{35,36}

These findings underscore that traditional practices cannot be separated from the socio-cultural context of the community, especially in areas with limited access to medical services. Therefore, the challenge is not simply to accept or reject traditional medicine but to develop an integrative model that respects local wisdom while upholding medical standards. Synergies between health professionals, researchers, policymakers, and community leaders are needed to raise awareness of the rational use of traditional medicine. Initiatives such as community-based education, certification of herbal products, and strengthening the capacity of local documentation can be initial strategies to encourage this transformation. Going forward, transdisciplinary research involving medicine, anthropology and pharmacology will be key to ensuring that culturally-rooted public health approaches are effective, and also safe and sustainable.

Interpretation of the network structure of traditional medicine use in DFU management

The visualisation results of our network analysis show that the use of traditional medicine in managing DFUs is not only driven by clinical effect considerations but is also strongly influenced by the social structure and cultural values rooted in the community. Nodes such as 'Family', 'Neighbour', 'Shaman' and 'Dream', that appear prominently in the network, reflect that the decision to use traditional medicine is largely shaped by informal knowledge transmission, collective beliefs and cultural authority, not just by professional medical recommendations. This finding aligns with previous research showing that the choice of traditional therapies often stems from strong social relationships and spiritual values within the community.³⁷ Ethnobotanical research further supports this, showing that family members and community peers are key sources of information in traditional healing practices in rural communities, and that the hereditary use of medicinal

plants is an integral part of cultural identity.^{37,38} Moreover, the integration of spiritual beliefs into traditional health practices is often viewed as a form of social validation for the treatment undertaken.³⁹ However, the use of unidentified substances—as reflected by the node labeled ‘Unknown’—raises important safety concerns. Previous studies have noted that limited understanding of the composition and dosage of traditional remedies may result in toxic side effects, worsening chronic wound conditions, and delaying timely access to appropriate medical care.^{39,40} Therefore, it is important to design an integrative healthcare model that prioritises clinical efficacy and considers the community’s cultural sensitivities and social realities. This approach will facilitate safer and evidence-based integration of traditional and modern medicine in managing diabetic foot ulcers.

Conclusion

The use of traditional medicine for DFU among Mandar ethnic groups reflects a combination of empirical knowledge and strong cultural values. Turmeric, honey, guava leaves, coconut oil and castor leaves were the most commonly used, often in raw, non-standardised form. Despite initial reported benefits, unsupervised use also led to clinical risks, such as infection and even amputation.

The transmission of knowledge through family members, community peers and traditional healers highlights the influence of both social and spiritual structures. Therefore, integrating evidence-based, yet culturally sensitive, traditional practices into modern healthcare systems is essential to ensure safety and effectiveness in diabetic foot ulcer management.

Conflict of interest

The authors declare no conflicts of interest.

Ethics statement

This research was conducted according to the principles of research ethics, with the approval of the Hasanuddin University Ethics Committee under number 822/UN4.18.3/TP.01.02/2024. Participants were given complete information regarding the objectives, procedures, and their rights and participated voluntarily through informed consent without coercion. Identity and personal data were kept confidential, while the entire research process was carried out by upholding human rights and academic integrity and avoiding potential harm to participants and related parties.

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