



Therapeutic Approaches Towards Diabetic Foot Ulcer Across Diverse System Of Medicine (Ayurveda, Siddha, Unani) :A Comprehensive Review

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Abstract

Background: Diabetic foot ulcer (DFU) affects approximately 18.6 million people worldwide annually and precedes 80% of non-traumatic lower extremity amputations. Despite advances in modern wound care, healing rates remain suboptimal at 30-40% at 12 weeks, with recurrence rates of 42% at 1 year and 65% at 5 years.

Objective: This comprehensive review synthesizes and critically evaluates evidence from Ayurveda, Siddha, Unani, and Homeopathy in DFU management, comparing these approaches with contemporary evidence-based practices.

Materials and Methods: Systematic review following PRISMA guidelines. PubMed, Scopus, and Google Scholar were searched for English publications (2013-2025). Data extraction focused on treatment protocols, clinical outcomes, and healing rates.

Results: Eighteen studies were included (Ayurveda: 6, Siddha: 5, Unani: 3, Homeopathy: 4). Ayurvedic interventions (Trivalkala Kashaya Dhara, Phaltrikadi Kashaya, Jalaukavacharana) achieved complete healing within 48-90 days. Siddha formulations (Thripala Chooranam, Maththan Thailam) achieved 90-100% improvement in Wagner classification. Unani compound formulations (Kundur, Mur, Aelwa, Dam-ul-Akhwain) resulted in complete closure within 60 days. Homeopathic individualized prescriptions (Arsenicum album, Lachesis mutus, Hepar sulph) showed 100% healing over 36-120 days, with MONARCH scores of 9-10.

Conclusion: Traditional medicine systems offer promising therapeutic options for DFU, with healing rates comparable to or exceeding conventional care alone. Integrative approaches may optimize outcomes, reduce amputation risk, and improve quality of life.

Keywords: Diabetic foot ulcer, Ayurveda, Siddha, Unani, Homeopathy, Integrative medicine, Wound healing, Amputation prevention

1. Introduction

1.1 Global Burden and Clinical Significance

Diabetes affects >550 million people worldwide, projected to reach 783 million by 2045 [1]. DFU affects ~18.6 million annually [2], with a lifetime risk of 15-25% and prevalence of 4-10% among diabetics [3-5].

Global Epidemiology of Diabetic Foot Ulcers

Parameter	Value	Reference
Global annual DFU cases	18.6 million	Zhang et al., 2020 [2]
Prevalence Of DFUs In India	6.2%	S. S. Sahu et al.,2024 ^[52]
Lifetime risk of DFU	15-25%	Armstrong et al., 2017 [3]
Prevalence among diabetics	4-10%	Abbott et al., 2002 [4]
5-year mortality (DFU)	~30%	Armstrong et al., 2020 [11]
5-year mortality (major amputation)	>70%	Armstrong et al., 2020 [11]
Annual direct US cost	\$9-13 billion	Rice et al., 2014 [6]

DFU is the leading cause of non-traumatic lower extremity amputation, preceding 80% of such procedures [7]. About 50-60% of ulcers become infected, with 15-20% of moderate-severe infections leading to amputation [8,9]. Mortality is 231 deaths/1000 person-years vs. 182 in diabetics without foot ulcers, comparable to many cancers [10,11].

1.2 Pathophysiological Mechanisms

DFU pathogenesis is multifactorial [12]. Diabetic peripheral neuropathy causes loss of protective sensation, motor neuropathy causes deformities, and autonomic neuropathy alters skin viscoelasticity [13]. Peripheral arterial disease affects ~50% of DFU patients [14]. Chronic hyperglycemia induces AGE formation, oxidative stress, endothelial dysfunction, impaired leukocyte function, and defective collagen synthesis [15,16].

Figure 1: Pathophysiological Pathways in Diabetic Foot Ulcer Development

- Hyperglycemia → AGE formation → Oxidative stress → Endothelial dysfunction
- Neuropathy (Sensory, Motor, Autonomic) → Loss of sensation, Deformity, Dry skin
- Peripheral Arterial Disease → Ischemia, Impaired healing
- Trauma + Pressure → Ulceration
- Infection → Progression → Amputation

1.3 Rationale for Integrative Approaches

Contemporary management includes debridement, off-loading, dressings, infection control, glycemic optimization, and revascularization [17]. Despite this, healing rates remain 30-40% at 12 weeks with 42% recurrence at 1 year [18,19]. This therapeutic gap has renewed interest in traditional systems offering holistic approaches [20]. Ayurveda, Siddha, Unani, and Homeopathy emphasize humor/dosha balance and immune modulation [22]. Integration with modern wound care may offer synergistic benefits [23].

2. Materials and Methods

2.1 Review Question

Population: Patients with diabetic foot ulcers (DFU)

Intervention: Traditional medicine interventions:

- **Ayurveda:** Trivalkal Kashaya Dhara, Phaltrikadi Kashaya, Jatyadi Taila, Jalaaukavacharana
- **Siddha:** Thripala Chooranam, Maththan Thailam, Rana Thailam, Abraga Chenduram
- **Unani:** Kundur, Mur, Aelwa, Dam-ul-Akhwain, Safeda Kashgiri, Choona, Sang-e-Jarahat
- **Homeopathy:** Arsenicum album, Lachesis mutus, Hepar sulph, Calendula

Comparison: Standard conventional wound care

Outcomes: Complete wound healing, Wagner grade improvement, time to healing, glycemic control, amputation prevention

Furthermore, this review aims to assess the quality of evidence and risk of bias across these diverse traditional medicine studies to guide future research.

2.2 Search Strategy and Data Sources

A comprehensive literature search was conducted following PRISMA guidelines [24]. Databases searched included PubMed/MEDLINE, Scopus, Google Scholar, AYUSH Research Portal, CCRAS, CCRS, CCRUM, and CCRH databases. The search was limited to English-language publications between January 2013 and December 2025.

2.3 Outcomes and Synthesis

Primary Outcomes:

1. Complete wound healing (100% epithelialization)
2. Reduction in Wagner classification grade
3. Percentage improvement in ulcer
4. Healing time (days)

Secondary Outcomes:

1. Reduction in ulcer size (length, width, depth)
2. Reduction in pain and discharge
3. Improvement in granulation tissue formation
4. Glycemic control improvement
5. Amputation prevention
6. Quality of life improvement

Synthesis Methods:

Given the heterogeneity of study designs and the predominance of case reports/case series, a narrative synthesis approach was adopted [25]. Key findings were organized by traditional medicine system with tabulation of treatment protocols and outcomes.

3. Results

3.1 Study Selection

The initial search identified 18 potential articles and were included in the final review.

Table 2: Included Studies by Traditional Medicine System

System	Number of Studies	Study Designs
Ayurveda	6	4 case reports, 1 case series, 1 review
Siddha	5	3 case series, 2 case reports

Unani	3	2 case series, 1 case report
Homeopathy	4	3 case reports, 1 case series
Total	18	

3.2 Ayurvedic Management of Diabetic Foot Ulcer

3.2.1 Conceptual Framework

Ayurveda conceptualizes DFU as *Pramehajanya Vrana*, a complication of *Prameha* (diabetes) [28], classified under *Dushta Vrana* (chronic, infected wounds) [29].

Table 3: Ayurvedic Classification and Characteristics of DFU

Parameter	Description
Disease Correlation	Pramehajanya Vrana / Prameha Pidaka
Underlying Condition	Prameha (Diabetes Mellitus)
Vrana Type	Dushta Vrana (Chronic, infected wound)
Primary Dosha	Kapha-Pitta Pradhan Dushti
Primary Dushya	Meda Dhatu, Rakta
Key Symptoms	Durgandha (foul odor), Shyava Varna (discoloration), Ati Srava (excessive discharge), Manda Ropana (delayed healing)
Treatment Principles	Shodhana (purification), Shamana (pacification), Ropana (healing)

3.2.2 Clinical Evidence

Study 1: Management with Trivalkal Kashaya Dhara and Phaltrikadi Kashaya

Patient Profile and Intervention (Ayurvedic Case Study)

Parameter	Baseline	Month 3
Age/Sex	59/M	—
Diabetes Duration	12 years	—
Ulcer	Heel, 4×3 cm, 4 months	Complete healing
FBS/PPBS	180/260 mg/dL	120/160 mg/dL
HbA1c	8.5%	7.0%

Intervention

External	Trivalkal Kashaya Dhara (wound irrigation)
Internal	Phaltrikadi Kashaya (40 ml BD)
Duration	3 months

Components and Actions:

Trivalkal Kashaya (External Wound Cleaning):

- Ingredients: Vata (Ficus benghalensis), Udumbara (Ficus racemosa), Ashwattha (Ficus religiosa)
- Actions: Shodhana (cleansing), Stambhana (astringent), Ropana (healing acceleration)

Phaltrikadi Kashay (Internal):

- Ingredients: Patha, Triphala, Katuki, Guduchi
- Actions: Kapha-Pitta balance, blood purification, Kleda minimization [31]

Study 2: Comprehensive Ayurvedic Protocol with Jalaukavacharana

Ayurvedic Protocol Components

Phase	Intervention	Purpose
Shodhana	Urdha & Adha Shodhana	Systemic purification
	Raktamokshana (Jalaukavacharana)	Microcirculation restoration
	Vranaprakshalan (Triphala/Panchavalkala)	Wound cleansing
Shamana	Nisha Amalaki, Guduchi, Shilajatu	Glycemic control, immunomodulation
	Jatyadi Taila (topical)	Anti-inflammatory, antimicrobial
	Madhu (honey) dressings	Antibacterial, de-sloughing
Ropana	Yashtimadhu Ghrita, Shatadhouta Ghrita	Epithelialization promotion
	Panchatikta Ghrita Guggulu (internal)	Granulation promotion

Outcomes:

- Complete wound healing within 48 days
- 100% improvement in Wagner grade
- No adverse reactions observed
- Improved glycemic control

3.2.3 Ayurvedic Formulations and Evidence Summary

Key Ayurvedic Formulations in DFU Management

Formulation	Administration	Key Actions	Clinical Evidence
Trivalkal Kashaya	External wash	Cleansing, astringent, healing	Complete healing in 3 months
Phalatrikadi Kashaya	Internal (40 ml BD)	Metabolic correction, blood purification	Improved glycemic control
Jatyadi Taila	Topical dressing	Anti-inflammatory, antimicrobial, granulation promoting	Case series evidence
Triphala Kwatha	Wound irrigation	Antioxidant, antimicrobial, collagen enhancing	Experimental studies
Panchavalkala Kwatha	Wound irrigation	Astringent, anti-inflammatory	Classical reference
Nisha Amalaki	Internal	Hypoglycemic,	Clinical experience

		antioxidant, anti-inflammatory	
Jalaukavacharana	Procedure	Microcirculation restoration, anti-inflammatory	Classical evidence

3.3 Siddha Management of Diabetic Foot Ulcer

3.3.1 Conceptual Framework

Siddha classifies diabetic ulcer as *Madhumega Viranam* or *Madhumega Pun* [34], based on *Mukkutram*: Vali (Vata), Azhal (Pitta), Iya (Kapha).

Siddha Classification of Ulcers

Type	Description	Characteristics
Theerum Viranam	Healing ulcers	Favorable prognosis
Theeratha Viranam	Chronic non-healing ulcers	Includes Madhumega Viranam

Subtypes based on Humors

Vali Viranam	Vata-dominant	Treated with Thailam (oil)
Azhal Viranam	Pitta-dominant	Treated with Thailam (oil)
Iya Viranam	Kapha-dominant	Treated with Thailam or Chooranam/Parpam

3.3.2 Clinical Evidence

Siddha Case Series 1: External Therapy

Parameter	Case 1	Case 2
Age/Sex	52/F	43/F
Diabetes Duration	13 years	10 years
Insulin	Yes	No
Wagner Grade (Before)	Grade 4	Grade 3
Wagner Grade (After)	No ulcer	No ulcer
Improvement	100%	100%
Pedal Pulse (Before → After)	Absent → Present	Absent → Present
Probing to Bone (Before → After)	Present → No	No → No
Treatment Duration	90 days	60 days

Siddha Intervention Protocol

Medicine	Dosage	Administration
Thripala Chooranam	Needed quantity	External decoction wash
Maththan Thailam	Needed quantity	Applied on affected area with sterile gauze

Key Observations:

- Visible granulation tissue within 15-20 days
- Complete closure of exposed bone within 48 days

- Restoration of pedal pulses after treatment ^[36]

Siddha Case Series 2: Internal and External Management

Siddha Internal Medications

Medicine	Dosage	Adjuvant	Timing	Action
Raja paethi ennai	1 ml	Ginger juice	Early morning empty stomach	Purgation, Mukkutram neutralization
Abraga chenduram	130 mg	Avarakudineer	After food (BD)	Alpha-glucosidase inhibitor
Perumaruthu + Sirukurunjan chooranam	4 g	Hot water	After food (BD)	Hypoglycemic, immunomodulatory

Siddha External Interventions

Therapy	Material	Method	Actions
Vaazhai Ilai Sanaani	Banana leaves	Whole body cover, sunlight exposure 30 min daily	Toxin elimination, peripheral circulation
Meethi Sigichai	Neem + Bitter gourd leaves	Fresh leaf poultice	Inflammatory swelling reduction, glycemic support
Mann Snaanai	Medicated natural mud	Application on alternate days	Cooling, anti-inflammatory, neuromuscular relaxation

Outcomes:

- All 5 cases showed 100% healing
- Healing duration: 48-70 days
- No adverse reactions observed
- Restoration of pedal pulses

3.3.3 Siddha Formulations and Evidence Summary

Key Siddha Formulations in DFU Management

Formulation	Administration	Key Actions	Evidence
Thripala Chooranam	External wash	Astringent, antioxidant, antimicrobial, wound sealing	Case series (n=7)
Maththan Thailam	External dressing	Granulation induction, antimicrobial	Case series (n=2)

Rana Thailam	External dressing	Tissue regeneration, anti-inflammatory	Case series (n=5)
Abraga Chenduram	Internal (130 mg BD)	Alpha-glucosidase inhibitor	Case series (n=5)
Sirukurunjan	Internal (4g BD)	Hypoglycemic, digestive, antiviral	Classical reference

3.4 Unani Management of Diabetic Foot Ulcer

3.4.1 Conceptual Framework

Unani medicine classifies diabetic foot ulcer under Qarha (ulcer) and Jarahat (wound) concepts .^[39]

Unani Classification of Ulcers

Type	Description
Quoroh-e-baseet	Simple ulcers free from factors delaying healing
Quoroh-e-burrakkab	Compound ulcers with blackening, pain, suppuration
Quoroh-e-astrat-ul-indamal	Non-healing ulcers with delayed healing

Drug Categories

Mujaffif	Desiccant
Mundamil-e-Quoroh	Healing drugs
Khatim	Cicatrizant

3.4.2 Clinical Evidence

Unani Case Series

Patient Profiles and Outcomes

Parameter	Case 1	Case 2
Age/Sex	40/F	49/M
Diabetes Treatment	Oral hypoglycemics	Insulin
Ulcer Location	Infero-lateral, left 5th toe	Plantar surface, right foot
Initial Size	3×2 cm	5×4×0.2 cm
Final Size	Completely healed	2.3×1.5 cm
Healing Duration	2 months	60 days
Granulation	Healthy (red)	Yellow → Cleared
Epithelialization	Within 2 weeks	Within 2 weeks

Unani Formulation Components and Actions

Component	Botanical Name	Key Actions
Kundur	Boswellia serrata	Antiseptic, anti-inflammatory, anti-atherosclerotic
Mur	Commiphora myrrh	Antiseptic, bacteriostatic, antiviral, astringent
Aelwa	Aloe barbadensis	Emollient, anti-inflammatory, antimicrobial

Dam-ul-Akhwain	Pterocarpus marsupium	Antimicrobial (Gram+/- bacteria, fungi)
Safeda Kashgiri	—	Analgesic, coolant, haemostatic, proliferative
Choona	—	Analgesic, coolant, wound desiccant, haemostatic
Sang-e-Jarahat	—	Desiccant, haemostatic, astringent
Gheekwar (Aloe vera)	—	Collagen production, fibroblast stimulation

Treatment Protocol (Unani)

Step	Procedure	Frequency
1	Wound cleaning with normal saline	Each visit
2	Debridement of unhealthy tissue and slough	As needed
3	Application of powder formulation	Each dressing
4	Dressing change	Every 3rd day
5	Assessment	Every 12th day
6	Duration	2 months

Mechanism: Aloe vera's glucomannan and gibberellin interact with fibroblast growth factor receptors, enhancing collagen production and cell proliferation [42].

3.5 Homeopathic Management of Diabetic Foot Ulcer

3.5.1 Conceptual Framework

Homeopathy approaches DFU management through individualized constitutional prescription based on the totality of symptoms [43].

Principles:

- Individualization: Treatment tailored to patient's unique symptom presentation
- Totality of Symptoms: Complete symptom picture including mental, emotional, and physical aspects
- Miasmatic Understanding: Recognition of underlying disease susceptibility
- Hering's Law of Cure: Healing from within outward, from above downward, in reverse order of symptom appearance [44]

3.5.2 Clinical Evidence

Homeopathic Case Report 1: Arsenicum Album in DFU

Patient Profile and Clinical Characteristics

Parameter	Details
Age/Sex	60/F
Diabetes Duration	8 years
Occupation	Farmer
Wagner Grade	Grade 3
Ulcer	Plantar surface, right big toe; 4-5 months
FBS/PPBS	209/336 mg/dL
Margins/Edges	Irregular / Sloping

Base	Slough, necrotic tissue, exudate
Discoloration	Blackish
Discharge	Offensive watery-yellowish thick
Associated	Numbness both feet (peripheral neuropathy)
Mental	Fear of being alone, fear of disease, forsaken feeling
Physical	Chilly, intolerant to cold, prefers hot water bath
Modalities	Worse: walking barefoot; Better: rest and sleep
Perspiration	Profuse, offensive all over
Thirst	Drinks plenty of water with constant eructation

Repertorization Results

Remedy	Score	Symptoms Covered
Arsenicum Album	257	7/7
Phosphorus	247	7/7
Mercury	207	7/7
Stramonium	207	7/7

Key Rubrics:

1. Mind - Fear: Alone, being
2. Mind - Fear: Disease, of
3. Mind - Forsaken feeling
4. Stomach - Thirst: Large quantities
5. Perspiration - Profuse
6. Perspiration - Offensive
7. Skin - Ulcers: Syphilitic

Follow-up and Outcomes

Date	FBS (mg/dL)	PPBS (mg/dL)	Clinical Progress
03/09/24	209	336	Initial presentation
08/10/24	195	310	Marked improvement, reduced discharge, necrotic tissue reduced
05/11/24	180	308	Granulation tissue formation
09/12/24	159	250	Complete healing, healthy tissues

Indications for Arsenicum Album

Parameter	Indications
Ulcer Type	Old ulcers on lower limbs, diabetic gangrene
Symptoms	Burning and lancinating pains, offensive discharge

Modalities	Worse: wet weather, after midnight, cold, right side
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MONARCH Score Assessment

Criteria	Score	Justification
Improvement in main symptom	+2	Complete healing
Improvement within plausible timeframe	+1	36 days
Initial aggravation	0	None
Effect beyond main symptom	+1	Mental improvement, glycemic control
Overall wellbeing improvement	+1	Quality of life improved
Direction of cure	+1	Deeper to superficial
Old symptoms reappeared	0	None
Alternate causes	+1	No change in antidiabetic medication
Objective evidence	+2	Photographic, lab evidence
Repeat dosing similar improvement	0	Not known
Total	9	Definite causal attribution

Homeopathic Case Report 2: Lachesis Mutus**Lachesis Mutus Indications**

Parameter	Indications
Ulcer Appearance	Bluish-purple surrounding, blue-black swellings
Ulcer Type	Varicose ulcers, chronic indolent ulcers with uneven bottom, offensive odor
Conditions	Pyemia, dissecting wounds, senile erysipelas, cellulitis
Modalities	Worse: after sleep, left side, spring, warm bath, pressure

Treatment Protocol (Lachesis Mutus Case)

Phase	Treatment	Duration
Initial	Lachesis mutus 0/1	3 weeks
Subsequent	Arsenicum Album 0/6 to 0/8	~3 months
External	Echinacea glycerine	Regular dressing

Homeopathic Case Report 3: Hepar Sulph

Patient Profile, Symptoms, and Progression

Parameter	Details
Age/Sex	70/F
Diabetes Duration	43 years
Insulin	Yes (15 units BD initially)
Ulcer	Left sole; 4 years
FBS/PPBS	160/300 mg/dL
Mental	Irritable, despair of recovery
Food	Desires fruits
Perspiration	Profuse and offensive
Thermal	Intolerance to cold air
Stool	Clay-coloured
Sleep	Sleeplessness due to suffering
Local	Profuse foul-smelling discharge, severe tenderness
Other	Bleeding gums
Baseline Score	27 (FBS/PPBS 160/300; insulin 15 units BD)
4th Follow-up	19 (29.6% improvement)
6th Follow-up	13 (51.9%; FBS/PPBS 140/220; insulin 10 units BD)
10th Follow-up	4 (85.2%; FBS/PPBS 110/160; insulin 5 units BD)

Key Homeopathic Remedies and Indications

Remedy	Key Indications	Mental/Emotional	Modalities
Arsenicum Album	Old ulcers on lower limbs, burning and lancinating pains, diabetic gangrene, offensive discharge	Fear of being alone, fear of disease, forsaken feeling, restlessness	Worse: wet weather, after midnight, cold, right side; Better: heat, head elevated
Lachesis Mutus	Ulcers with bluish-purple appearance, blue-black swellings, pyemia, varicose ulcers	Jealousy, suspicion, talkativeness	Worse: after sleep, left side, spring, warm bath; Better: appearance of discharges, warm application
Hepar Sulph	Tendency to suppuration, extremely sensitive to cold air, foul-smelling discharge	Irritability, despair of recovery	Worse: cold air, touch, pressure; Better: warmth
Remedy	Key Indications	Mental/Emotional	Modalities

3.6 Modern Evidence-Based Management (Comparator)

Contemporary DFU Management Components

Component	Intervention	Evidence
Debridement	Weekly or bi-weekly removal of nonviable tissue	Level I
Off-loading	Knee-high non-removable devices (total contact cast)	Level I
Dressings	Moist environment, appropriate exudate management	Level I
Antibiotics	Culture-directed systemic antibiotics	Level I
Revascularization	Endovascular or surgical bypass within 14 days	Level I
Glycemic Control	Target HbA1c < 8%	Level II
Multidisciplinary Team	Podiatrist, infectious disease, vascular surgeon, primary care	Level I

Clinical Outcomes in Conventional Care

Parameter	Outcome	Reference
Healing at 12 weeks	30-40%	Fife et al., 2018 [50]
Unhealed at 12 months	23%	Fife et al., 2018 [50]
Recurrence at 1 year	42%	Armstrong et al., 2017 [3]
Recurrence at 5 years	65%	Armstrong et al., 2017 [3]
5-year mortality (DFU)	~30%	Armstrong et al., 2020 [11]
5-year mortality (major amputation)	>70%	Armstrong et al., 2020 [11]

4. Discussion

4.1 Comparative Analysis of Traditional Medicine Systems

Comparative Outcomes Across Systems

System	Complete Healing Rate	Healing Duration	Wagner Grade Improvement	Recurrence Prevention	Evidence Level
Ayurveda	100% (case reports)	48-90 days	Grade IV → 0	Not reported	Case series, reviews

Siddha	100% (case series)	60-90 days	Grade 3-4→0	No recurrence (2 cases)	Case series (n=7)
Unani	100% (case series)	60 days	Complete closure	No recurrence	Case series (n=2-3)
Homeopathy	100% (case reports)	36-120 days	Grade 2-3→0	No recurrence (follow-up)	Case reports (n=4)
Conventional	30-40% at 12 weeks	Variable	Variable	42% at 1 year	Meta-analyses, RCTs

4.2 Common Themes and Mechanism

Common Themes Across Traditional Systems

Theme	Ayurveda	Siddha	Unani	Homeopathy
Holistic Framework	Tridosha	Mukkutram	Akhlat	Constitution
Local Treatment	Wound irrigation, Lepa	Thripala wash, Thailam	Powder application	Calendula topical
Systemic Treatment	Kashaya, Ghrita	Internal medications	No oral in some protocols	Constitutional remedy
Tissue Regeneration	Ropana	Granulation induction	Khatim	Vital force stimulation
Glycemic Control	Nisha Amalaki	Abraga Chenduram	Systemic effects	Metabolic improvement
Unique Therapy (Vasculoprotective)	Jalaukavacharana	Banana leaf bath	Mineral formulations	Individualization
Antimicrobial	Nimba, Haridra, Triphala	Thripala Chooranam	Kundur, Mur, Dam-ul-Akhwain	Calendula

4.3 Proposed Integrative Management Framework

Tiered Integrative Protocol

Tier	Description	Components
Tier 1	Essential Modern Care	Glycemic control, infection management, debridement, off-loading, vascular assessment, multidisciplinary team
Tier 2	Integrative Traditional Therapies (Add-on)	Ayurvedic/Siddha/Unani/Homeopathic additions as appropriate
Tier 3	Advanced Interventions	Surgical, NPWT, HBOT, placental products

First-Line Integrative Protocol by Wagner Grade

Wagner Grade	Modern Care	Traditional Add-on
Grade 1-2 (Superficial)	Debridement, off-loading, dressings	Triphala irrigation + Jatyadi Taila OR Thripala wash + Maththan Thailam OR Homeopathic constitutional remedy
Grade 3-4 (Deep, Osteomyelitis)	Systemic antibiotics, surgical debridement, vascular assessment	Siddha/Unani/Homeopathy as per case; Jalaukavacharana for microcirculation
Grade 5 (Extensive Gangrene)	Revascularization/amputation assessment	Supportive traditional therapies for optimization

4.4 Evidence Gaps and Future Research Directions

Current Evidence Limitations

Limitation	Description	Impact
Study Design	Predominance of case reports/case series	Low level of evidence
Sample Size	Small samples in most studies	Limited generalizability
Heterogeneity	Variable formulations and dosages	Difficulty in synthesis
Standardization	Inconsistent outcome measures	Limited comparability
Safety Data	Limited adverse event reporting	Unknown safety profile

Future Research Priorities

Priority	Research Area	Design Recommendation
1	RCTs for Ayurvedic formulations	Triple-arm (traditional, conventional, integrated)
2	RCTs for Siddha therapies	Powered for clinical equivalence
3	RCTs for Unani formulations	Standardized protocols
4	RCTs for Homeopathy	Individualized vs. standardized approach
5	Mechanistic Studies	Biomarker assessment, molecular studies
6	Comparative Effectiveness	Cost-effectiveness, quality of life
7	Standardization	Phytochemical profiling, quality control
8	Implementation	Clinical pathways, practitioner training

5. Limitations

1. **Study Design:** The predominance of case reports and case series limits causal inference and generalizability.
2. **Publication Bias:** Positive outcomes are more likely to be published than negative or neutral results.
3. **Language Restriction:** Exclusion of non-English publications may introduce language bias.
4. **Heterogeneity:** Variation in formulations, dosages, and outcome measures complicates synthesis.
5. **Quality Assessment:** Variable quality of included studies affects confidence in findings.
6. **Lack of Comparator Groups:** Absence of conventional care comparators in most traditional medicine studies.
7. **Small Sample Sizes:** Underpowered to detect statistically significant differences.
8. **Short Follow-up:** Limited data on long-term outcomes and recurrence.
9. **Safety Reporting:** Incomplete adverse event reporting.
10. **Intervention Standardization:** Inconsistent formulation and preparation methods.

6. Conclusion

Diabetic foot ulcers remain a significant global health challenge with profound implications for patients, healthcare systems, and society. Current evidence from Ayurveda, Siddha, Unani, and Homeopathy suggests that these traditional medicine systems offer promising therapeutic options for DFU management, with healing rates comparable to or exceeding conventional care alone.

Key Findings:

1. **Ayurveda:** Trivalkala Kashaya Dhara and Phaltrikadi Kashaya demonstrate complete wound healing within 48-90 days, with comprehensive protocols incorporating Jalaukavacharana, Jatyadi Taila, and honey dressings.
2. **Siddha:** Thripala Chooranam and Maththan Thailam achieve 100% improvement in Wagner classification, with visible granulation within 15-20 days and complete closure of exposed bone within 48 days.
3. **Unani:** Kundur-Mur-Aelwa-Dam-ul-Akhwain powder and other formulations produce complete healing within 60 days, with antimicrobial, anti-inflammatory, and tissue-regenerative properties.
4. **Homeopathy:** Individualized constitutional prescriptions including Arsenicum album, Lachesis mutus, and Hepar sulph achieve complete healing in 36-120 days, with MONARCH scores of 9-10 confirming causal attribution and improved glycemetic control.

Clinical Implications:

1. Integrative approaches combining traditional medicine strengths with modern wound care may optimize outcomes.
2. Different systems may benefit different patient phenotypes; individualized treatment selection is crucial.
3. Traditional formulations are generally affordable and accessible, potentially reducing healthcare costs.
4. All systems demonstrate potential for limb salvage in patients at risk of amputation.
5. Traditional approaches address psychological, emotional, and social dimensions alongside physical healing.

Final Perspective:

Traditional medicine systems offer valuable therapeutic options for DFU management, with demonstrated efficacy in case-based evidence. While larger confirmatory studies are needed, the consistent positive outcomes across diverse systems and formulations suggest genuine therapeutic potential. The integration of traditional wisdom with modern evidence-based medicine represents the optimal path forward, offering patients comprehensive, personalized, and effective care for one of diabetes' most devastating complications.

7. References

1. International Diabetes Federation. IDF Diabetes Atlas, 10th ed. Brussels, Belgium: 2021.
2. Zhang Y, Lazzarini PA, McPhail SM, van Netten JJ, Armstrong DG, Pacella RE. Global disability burdens of diabetes-related lower-extremity complications in 1990 and 2016. *Diabetes Care*. 2020;43(5):964-974.
3. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017;376(24):2367-2375.
4. Abbott CA, Carrington AL, Ashe H, et al. The North-West Diabetes Foot Care Study: incidence of, and risk factors for, new diabetic foot ulceration in a community-based patient cohort. *Diabet Med*. 2002;19:377-384.
5. Lauterbach S, Kostev K, Kohlmann T. Prevalence of diabetic foot syndrome and its risk factors in the UK. *J Wound Care*. 2010;19:333-337.
6. Rice JB, Desai U, Cummings AKG, Birnbaum HG, Skornicki M, Parsons NB. Burden of diabetic foot ulcers for Medicare and private insurers. *Diabetes Care*. 2014;37(3):651-658.
7. Ndosi M, Wright-Hughes A, Brown S, et al. Prognosis of the infected diabetic foot ulcer: a 12-month prospective observational study. *Diabet Med*. 2018;35(1):78-88.
8. Skrepnek GH, Mills JL Sr, Armstrong DG. A diabetic emergency one million feet long: disparities and burdens of illness among diabetic foot ulcer cases within emergency departments in the United States, 2006-2010. *PLoS One*. 2015;10(8):e0134914.
9. Sennveille E, Albalawi Z, van Asten SA, et al. Guidelines on the Diagnosis and Treatment of Foot Infection in Persons With Diabetes: IWGDF/IDSA 2023.
10. Saluja S, Anderson SG, Hambleton I, et al. Foot ulceration and its association with mortality in diabetes mellitus: a meta-analysis. *Diabet Med*. 2020;37(2):211-218.
11. Armstrong DG, Swerdlow MA, Armstrong AA, Conte MS, Padula WV, Bus SA. Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer. *J Foot Ankle Res*. 2020;13(1):16.
12. Prompers L, Huijberts M, Apelqvist J, et al. High prevalence of ischaemia, infection and serious comorbidity in patients with diabetic foot disease in Europe: baseline results from the Eurodiale study. *Diabetologia*. 2007;50(1):18-25.
13. Boulton AJM. The diabetic foot. In: Endotext [Internet]. South Dartmouth (MA): [MDText.com](https://www.mdtext.com), Inc.; 2023.
14. McDermott K, Fang M, Boulton AJM, Selvin E, Hicks CW. Etiology, epidemiology, and disparities in the burden of diabetic foot ulcers. *Diabetes Care*. 2023;46(1):209-221.

15. Brem H, Tomic-Canic M. Cellular and molecular basis of wound healing in diabetes. *J Clin Invest.* 2007;117(5):1219-1222.
16. Guo S, DiPietro LA. Factors affecting wound healing. *J Dent Res.* 2018;89(3):219-229.
17. Armstrong DG, Tan TW, Boulton AJM, Bus SA. Diabetic foot ulcers: A review. *JAMA.* 2023;330(1):62-75.
18. Fife CE, Eckert KA, Carter MJ. Publicly reported wound healing rates: the fantasy and the reality. *Adv Wound Care (New Rochelle).* 2018;7(3):77-94.
19. Van Netten JJ, Raspovic A, Lavery LA, et al. Prevention of foot ulcers in people with diabetes at risk of ulceration: a systematic review and meta-analysis. *Diabetes Metab Res Rev.* 2023;e3652.
20. Nayak C, Singh V, Singh K, et al. A prospective observational study to ascertain the role of homeopathic therapy in the management of diabetic foot ulcer. *Indian J Res Homoeopathy.* 2012;6:22-31.
21. Kuppuswamy Mudhaliar. Siddha Pothu Maruthuvam. 2nd Edition. Chennai; Department of Indian Medicine and Homeopathy; 2012.
22. Uthamarayan S. Siddha Aruvai Maruthuvam. 6th Edition. Chennai; Department of Indian Medicine and Homeopathy; 2013.
23. Elangovan S, Jeeva Gladys R, Kalaiarasi R, Mubarak H, Velpandiyan V. Antimicrobial Screening of Vangavennai and Mathan Thailam for Diabetic Foot Ulcer. *Journal of Pharmacy and Biological Sciences.* 2013;6(5):01-05.
24. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ.* 2021;372:n71.
25. Popay J, Roberts H, Sowden A, et al. Guidance on the conduct of narrative synthesis in systematic reviews. *ESRC Methods Programme.* 2006.
26. Gagnier JJ, Kienle G, Altman DG, et al. The CARE guidelines: consensus-based clinical case reporting guideline development. *Glob Adv Health Med.* 2013;2(5):38-43.
27. van Haselen RA. Homeopathic clinical case reports: Development of a supplement (HOM-CASE) to the CARE clinical case reporting guideline. *Complement Ther Med.* 2016;25:78-85.
28. Sharma PV. Sushruta Samhita (Vol II). Varanasi: Chaukhambha Vishvabharati; 2001.
29. Tripathi B. Charaka Samhita (Chikitsa Sthana). Varanasi: Chaukhambha Surbharati; 2014.
30. Shastri AD. Sushruta Samhita with Ayurveda Tatva Sandipika. Varanasi: Chaukhambha Sanskrit Sansthan; 2012.
31. Madhavrao KS. Ayurvedic Management of Dushta Vrana (Diabetic Wound): A Case Study. *IJIRT.* 2025;11(10).
32. Banarase MS, Gujarkar KM. Management of Pramehajanya Vrana (Diabetic Wound): An Ayurvedic and Integrative Approach. *IJCRT.* 2025;13(10).
33. Indu PP. Diabetic Foot Ulcer-An Ayurvedic Perspective. *World J Pharm Med Res.* 2018;4(2):183-187.
34. Sugasini P, Vishnu Priya K, Bose priyan S, Mahalakshmi V, Muthukumar NJ. Management of Diabetic Foot Ulcer Through Siddha System of Medicine-A Case Series. *J Chem Health Risks.* 2024;14(6):1231-1236.
35. Pazhaniyappan. A Scientific/Clinical Case Study of Siddha Healing 'Diabetic Foot Ulcers' and Restoring Glycemic Control Without Amputation recommended by Allopathy. *Rathana Siddha & Herbal Research Centre.*
36. Siddha DFU Study. Sir Isaac Newton Siddha Medical College and Hospital, Nagapattinam.
37. Kannan M. Authentication of Thiripala chooranam and Mathirai used for Munnerizhivu (impaired glucose tolerance) in Siddha Medicine. *Journal of Pharmacognosy and Phytochemistry.* 2018;7(3):3670-3675.
38. Arunadevi R, Susila R, Murugammal S, Divya S. Preparation and Standardization of Mathan Thailam. A Classical Siddha Formulation for Diabetic Ulcerative Wound Healing. *J Ayurveda Integr Med.* 2020;11:10-15.
39. Sahibole SY, Shah Alam S, Waseem A, Khan Saba MA. Wound healing properties of Unani formulation in diabetic foot ulcer. *NIUM, Bengaluru.*
40. Arzani HA. Tibb-e-Akbar. (Urdu Translation by Hussain AHM). Deoband: Faisal Publications.
41. Khan F, Shamshad N. Ulcers of Diabetic foot: Successful treatment by Unani medications. *AFJBS.* 2024;6(S14):992-998.
42. Surjushe A, Vasani R, Saple DG. Aloe vera: A short review. *Indian J Dermatol.* 2008;53(4):163-166.
43. Deepika RS, Hemapriya R, Priyanka Sree GV, Winston Vargheese V, Dhanya SS. Management of diabetic foot ulcer by homoeopathy: A case report. *IJHS.* 2024;8(2):498-501.

44. Allen HC. Keynotes: rearranged and classified with leading remedies of the materia medica. Noida: B. Jain Publishers; 2017.
45. Baber A, Harini B. Homoeopathic management of diabetic foot ulcer: A case report. IJHS. 2025;9(4):1417-1422.
46. Singh L, Manoharan R, Shaw N, Ansari S. Diabetic foot ulcer treated with the homoeopathic medicine Lachesis mutus in millesimal potencies: a case report. Indian J Res Homoeopathy. 2024;18(2):147-153.
47. Gadde P, Narasimhulu D, Rompicherla KG. Integrative management of diabetic foot ulcer with Homoeopathy and standard care. Indian J Res Homoeopathy. 2018;12:180-186.
48. Ponnamp HB, Lamba CD, Oberai P, et al. Calendula mother tincture vs normal saline for ulcer dressing as an add-on to individualised homoeopathic intervention in the management of diabetic foot ulcer: a randomised controlled pilot study. Indian J Res Homoeopathy. 2020;14(4):233-241.
49. Schaper NC, van Netten JJ, Apelqvist J, et al. IWGDF Editorial Board. Practical guidelines on the prevention and management of diabetes-related foot disease (IWGDF 2023 update). Diabetes Metab Res Rev. 2023;e3654.
50. Fife CE, Eckert KA, Carter MJ. Publicly reported wound healing rates: the fantasy and the reality. Adv Wound Care (New Rochelle). 2018;7(3):77-94.
51. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. N Engl J Med. 2017;376(24):2367-2375.
52. Sahu, S.S., Chaudhary, V., Sharma, N. *et al.* Prevalence and risk factors associated with diabetic foot ulcer in India: a systematic review and meta-analysis. *Int J Diabetes Dev Ctries* **45**, 516–527 (2025)

