

Effectiveness of Ayurvedic Interventions in the Management of Chronic Ulcers: A Protocol for Systematic Review

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Effectiveness of Ayurvedic Interventions in the Management of Chronic Ulcers: A Protocol for Systematic Review

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Abstract

Background: Chronic ulcers—including diabetic foot ulcers, venous leg ulcers, arterial ulcers, and pressure injuries—pose a global health challenge due to prolonged healing, high recurrence, and risk of infection, amputation, and mortality. Conventional wound care technologies have improved outcomes but remain variably effective, particularly in resource-limited settings. In India, Ayurveda continues to be practiced for wound care, with classical texts such as the Sushruta Samhita detailing descriptions of Dushta Vrana (chronic ulcers) and therapeutic modalities including herbal formulations, irrigation, debridement, fumigation, and surgical interventions. While these interventions are widely applied in practice, the evidence base remains fragmented, heterogeneous, and insufficiently synthesized. A systematic review is warranted to critically appraise available literature on Ayurvedic interventions in chronic ulcer care.

Objective: This review aims to systematically identify and synthesize evidence on Ayurveda-based interventions for chronic ulcers, focusing on (1) diagnostic criteria, (2) assessment parameters, (3) treatment rationale, (4) topical and systemic therapies used, and (5) reported outcomes.

Methods: We will include randomized controlled trials, non-randomized studies, and case reports involving human participants with chronic ulcers of any etiology. Interventions include Ayurveda-based topical or systemic therapies, alone or in combination with other treatments. Primary outcome is wound healing; secondary outcomes include healing rate, unit healing time, epithelialization, neovascularization, antimicrobial activity, and recurrence. Databases searched will include PubMed, Embase, CENTRAL, Scopus, AYUSH Research Portal, DHARA, and Shodhganga, alongside grey literature. Risk of bias will be assessed using RoB 2 for RCTs and ROBINS-I for non-randomized studies. Data synthesis will follow PRISMA 2020 guidelines, with meta-analysis where feasible and narrative synthesis otherwise.

Results: As this is a protocol, results are not yet available.

Conclusions: This systematic review will provide a consolidated evaluation of Ayurvedic interventions in chronic ulcer management, identify research gaps, and inform the development of evidence-based integrative wound care strategies. Clinical Trial: PROSPERO registration No- CRD420251077147

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Original Manuscript

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Abstract

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Chronic ulcers—including diabetic foot ulcers, venous leg ulcers, arterial ulcers, and pressure injuries—pose a global health challenge due to prolonged healing, high recurrence, and risk of infection, amputation, and mortality. Conventional wound care technologies have improved outcomes but remain variably effective, particularly in resource-limited settings. In India, Ayurveda continues to be practiced for wound care, with classical texts such as the Sushruta Samhita detailing descriptions of Dushta Vrana (chronic ulcers) and therapeutic modalities including herbal formulations, irrigation, debridement, fumigation, and surgical interventions. While these interventions are widely applied in practice, the evidence base remains fragmented, heterogeneous, and insufficiently synthesized. A systematic review is warranted to critically appraise available literature on Ayurvedic interventions in chronic ulcer care.

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Results:

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Trial Registration: PROSPERO 2025 CRD420251077147

1. Background

Chronic ulcers—including diabetic foot ulcers, venous leg ulcers, pressure injuries, and related wound types—represent a major clinical challenge due to their prolonged course, high recurrence rates, and risk of severe complications. Healing outcomes remain poor; for example, only 30–40% of diabetic foot ulcers achieve closure within 12 weeks, while recurrence occurs in approximately 42% of cases at one year and up to 65% at five years.(1–3) Venous leg ulcers are similarly problematic, with a recurrence rate of 50.4–55% within the first year.(4) Infection is a frequent complication, affecting 50–60% of diabetic foot ulcers, and severe infections necessitate lower extremity amputation in nearly 20% of moderate to severe cases.(2) Limb loss is particularly devastating, as diabetic foot ulcers precede nearly 80% of lower extremity amputations, and major amputations carry a 5-year mortality rate exceeding 70%.(2)

Despite advancements in wound care technologies, including negative pressure therapy, bioengineered dressings, and advanced antimicrobials, the management of chronic ulcers remains challenging. Outcomes often vary, and in resource-constrained settings, access to such modalities may be limited.

In India, Ayurveda continues to be widely practiced as a traditional healthcare system, including for wound care. Classical Ayurvedic texts such as the Sushruta Samhita provide detailed descriptions of Dushta Vrana (chronic or non-healing ulcers), with guidance on classification, pathogenesis, healing stages, and therapeutic approaches. Interventions include internal and external herbal formulations, medicated irrigation (parisheka), debridement (shodhana), fumigation (dhupana), surgical measures, and wound healing enhancers (ropana).(5)

While these interventions are regularly employed in Ayurvedic clinical practice, systematic evaluation of their efficacy and safety remains limited. Several clinical studies have explored the benefits of individual Ayurvedic therapies in the management of chronic wounds; however, the literature is fragmented and heterogeneous. Several gaps persist: the overall effectiveness of Ayurvedic protocols across ulcer types is unclear; diagnostic and therapeutic frameworks lack standardization; outcome measures often vary or are not validated; and integration with conventional care lacks consensus or formal structure.

Therefore, a systematic review is warranted to aggregate and critically appraise existing evidence on Ayurvedic interventions in chronic ulcer care. Such an analysis can identify strengths, limitations, and research gaps in the current literature, while supporting the development of standardized,

evidence-informed integrative strategies for chronic wound management

2. Objectives

1. To systematically review and synthesize findings from case reports documenting the management of chronic ulcers using Ayurveda-based interventions.
2. To systematically review the diagnostic criteria used.
3. To systematically review the assessment parameters used.
4. To systematically review the rationale behind the treatment used.
5. To systematically review the topical and systemic therapeutic agents used.
6. To systematically review the outcome measures used.

3. Methods

3.1 Criteria for considering studies for this review

3.1.1 Types of Studies-

Both randomized and non-randomized study types including case reports, quasi-experimental designs, RCTs.

3.1.2 Types of Participants

Human participants with chronic ulcers of any aetiology (venous leg ulcers, diabetic foot ulcers, arterial leg ulcers, trophic ulcers, pressure ulcers, foot ulcers, leg ulcers, and other chronic wounds of skin and subcutaneous tissue), age, or gender.

3.1.3 Types of Interventions

Any Ayurveda-based topical or systemic interventions used alone or in combination with other therapies.

3.1.4 Types of Outcome measures

Primary outcomes

Wound Healing

Secondary outcomes

1. Healing rate
2. Unit healing time
3. Epithelialization
4. Neovascularization
5. Antimicrobial activity
6. Recurrence rate

3.2 Search strategies

3.2.1 Electronic searches

A comprehensive literature search will be conducted across multiple databases from their inception to the present to identify all relevant studies on Ayurvedic interventions for chronic ulcer management. The search will include major international databases such as CENTRAL (Cochrane Central Register of Controlled Trials), The Cochrane Library, Embase (via Ovid and Embase.com), MEDLINE, PubMed, Scopus and Google Scholar. Additionally, Ayurveda-specific databases including the AYUSH Research Portal, DHARA, Shodhganga will be searched to capture traditional knowledge and regional publications. Only English-language articles will be included, and all types of clinical studies will be considered for selection. The search strategy will use MeSH terms, controlled vocabulary, and free-text terms combined with Boolean and proximity operators. Appropriate filters will be applied for study design, publication date, and language restrictions. The complete PubMed search strategy with all Boolean operators, filters, and field tags is presented in Table 1.

Search Query	Results	Time	Date
(((("Ulcer"[MeSH] OR "Diabetic Foot"[MeSH] OR "Pressure Ulcer"[MeSH] OR "Varicose Ulcer"[MeSH] OR "Leg Ulcer"[MeSH] OR "Foot Ulcer"[MeSH] OR "Skin Ulcer"[MeSH] OR "Wound Healing"[MeSH] OR "Chronic Disease"[MeSH]) OR (chronic ulcer*[tiab] OR chronic wound*[tiab] OR "non-healing ulcer*[tiab] OR "non-healing wound*[tiab] OR "nonhealing ulcer*[tiab] OR "nonhealing wound*[tiab] OR "slow healing ulcer*[tiab] OR "slow healing wound*[tiab] OR "delayed healing ulcer*[tiab] OR "delayed healing wound*[tiab] OR "venous leg ulcer*[tiab] OR "venous ulcer*[tiab] OR "venous stasis ulcer*[tiab] OR "diabetic foot ulcer*[tiab] OR "diabetic ulcer*[tiab] OR "diabetic wound*[tiab] OR "arteritic leg ulcer*[tiab] OR "arterial ulcer*[tiab] OR "ischemic ulcer*[tiab] OR "ischaemic ulcer*[tiab] OR "pressure ulcer*[tiab] OR "pressure sore*[tiab] OR "decubitus ulcer*[tiab] OR bedsore*[tiab] OR "chronic trophic ulcer*[tiab] OR "trophic ulcer*[tiab] OR "foot ulcer*[tiab] OR "leg ulcer*[tiab] OR "skin ulcer*[tiab] OR "cutaneous ulcer*[tiab] OR "dushta vrana"[tiab] OR vrana[tiab] OR "dushtavrana"[tiab])) AND ("Medicine, Ayurvedic"[MeSH] OR "Medicine, Traditional"[MeSH] OR "Complementary Therapies"[MeSH] OR "Plant Extracts"[MeSH] OR "Plants, Medicinal"[MeSH] OR "Phytotherapy"[MeSH] OR "Medicine, Herbal"[MeSH] OR "Integrative Medicine"[MeSH]) OR (Ayurveda*[tiab] OR	1845	10:09:05	20-09-2025

ayurvedic[tiab] OR "traditional Indian medicine"[tiab] OR "Indian traditional medicine"[tiab] OR "traditional medicine"[tiab] OR "vrana ropana"[tiab] OR "vrana shodhana"[tiab] OR "vrana prakshalana"[tiab] OR "vrana lepa"[tiab] OR "vranaropana"[tiab] OR "vranashodhana"[tiab] OR "vranaprakshalana"[tiab] OR "vranalepa"[tiab] OR "panchakarma"[tiab] OR "pancha karma"[tiab] OR abhyanga[tiab] OR swedana[tiab] OR virechana[tiab] OR vamana[tiab] OR nasya[tiab] OR basti[tiab] OR rasayan*[tiab] OR "rasayana"[tiab] OR kashaya[tiab] OR kwatha[tiab] OR churna[tiab] OR choorna[tiab] OR guggulu[tiab] OR triphala[tiab] OR kshara[tiab] OR kshar[tiab] OR jaloukavacharan*[tiab] OR "jalaaukavacharan"[tiab] OR "leech therapy"[tiab] OR "leech therapies"[tiab] OR "medicinal leech*[tiab] OR hirudo*[tiab] OR raktamokshan*[tiab] OR "raktamokshana"[tiab] OR "bloodletting"[tiab] OR "herbal medicine"[tiab] OR "herbal intervention*[tiab] OR "herbal treatment*[tiab] OR "herbal therapy"[tiab] OR "herbal therapies"[tiab] OR "complementary medicine"[tiab] OR "alternative medicine"[tiab] OR "integrative medicine"[tiab] OR "traditional healing"[tiab])) AND ("humans"[MeSH Terms]) AND ("english"[Language])) AND (((("Clinical Trial"[Publication Type] OR "Randomized Controlled Trial"[Publication Type] OR "Controlled Clinical Trial"[Publication Type] OR "Comparative Study"[Publication Type] OR "Evaluation Study"[Publication Type] OR "Observational Study"[Publication Type] OR "Case Reports"[Publication Type] OR "Case Report"[Publication Type]) OR (randomized[tiab] OR randomised[tiab] OR "controlled trial*[tiab] OR "clinical trial*[tiab] OR "comparative study"[tiab] OR "comparative studies"[tiab] OR "intervention study"[tiab] OR "intervention studies"[tiab] OR "observational study"[tiab] OR "observational studies"[tiab] OR "case series"[tiab] OR "case report*[tiab] OR "pilot study"[tiab] OR "pilot studies"[tiab] OR "feasibility study"[tiab] OR "feasibility studies"[tiab] OR prospective[tiab] OR retrospective[tiab] OR cohort[tiab] OR "cross sectional"[tiab] OR "cross-sectional"[tiab]))))			
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AND (((("wound healing"[tiab] OR "ulcer healing"[tiab] OR "healing rate*"[tiab] OR "healing time"[tiab] OR "time to heal*"[tiab] OR epithelialization[tiab] OR epithelialisation[tiab] OR neovascularization[tiab] OR neovascularisation[tiab] OR "antimicrobial activity"[tiab] OR "antibacterial activity"[tiab] OR "recurrence rate*"[tiab] OR "recurrence"[tiab] OR "treatment outcome*"[tiab] OR "therapeutic outcome*"[tiab] OR "clinical outcome*"[tiab] OR efficacy[tiab] OR effectiveness[tiab])))			
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3.2.2 Grey literature

Grey literature will be identified through targeted searches of selected repositories and by contacting relevant institutions and researchers to locate unpublished studies. Reference lists of included studies and relevant review articles will be manually searched to ensure complete coverage and reduce publication bias.

3.3 Data Collection and Analysis

3.3.1 Selection of studies

Two independent reviewers (Reviewer 1 and Reviewer 2) will screen titles and abstracts for those matching the eligibility criteria. Full texts of relevant studies will be retrieved. Excluded studies will be listed in a table including reason for exclusion. Disagreements will be resolved by discussion involving Reviewers 3,4,5, as needed. PRISMA flow diagram will be used for documentation. (Figure 1)

3.3.2 Data extraction and management

Data extraction will be performed independently by two reviewers (Reviewer 1 and Reviewer 2) using a standardized data collection form. Key study characteristics, including author information, publication year, study design, participant demographics, diagnostic criteria, intervention details, comparators, outcome measures, and follow-up duration, will be recorded. Any discrepancies between the two reviewers' entries will be resolved through discussion, involving Reviewer 3, Reviewer 4, Reviewer 5, as needed. Extracted data will be managed and synthesized using Review Manager (RevMan 5.4), which will facilitate data organization, assessment of risk of bias, and preparation of summary tables and forest plots for meta-analysis where appropriate.

3.3.3 Assessment of Risk of Bias

For RCTs, the Cochrane Risk of Bias (RoB 2) tool will be used to assess the risk of bias.(6) For non-randomized studies, the Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) tool will be employed.(7)

Characteristics Assessed

Randomization: Methods of random sequence generation and allocation concealment.

Blinding: Whether participants, personnel, and outcome assessors were blinded.

Outcome data: Completeness of outcome data, handling of missing data, and reporting of all prespecified outcomes.

Treatment allocation: Appropriateness and description of intervention allocation, including any

deviations from the intended intervention.

Other biases: Consideration of other potential sources of bias, such as funding sources or conflicts of interest.

Assessment level: Bias will be assessed at the study level for general methodological quality and at the outcome level for specific key outcomes such as IOP reduction and visual field progression.

Reviewers: Two independent reviewers (Reviewer 1 and Reviewer 2) will assess the risk of bias in each study. If discrepancies arise between the reviewers, they will be resolved through discussion involving Reviewer 3, Reviewer 4 and Reviewer 5 will be done to reach the decision.

3.3.4 Measures of Effect of methods

For outcomes such as Healing Rate, Antimicrobial activity, Recurrence Rate, Odds Ratio (OR) will be used. For outcomes such as Unit Healing time, Epithelialization, Neovascularization, Bacterial load, Mean Difference (MD) and Standardized Mean Difference (SMD) will be used. The random-effects model will be used to estimate pooled effects, accounting for variation between studies due to differences in population, interventions, or outcome measurements.

3.3.5 Dealing with missing Data

Additional information will be sought from study investigators if required information is unclear or unavailable in the study publications/reports.

3.3.6 Assessment of heterogeneity

Heterogeneity will be assessed using the I^2 statistic. A threshold of $I^2 \leq 50\%$ will be considered acceptable for combining data in a meta-analysis.(8) If substantial statistical heterogeneity is detected ($I^2 > 50\%$), we will explore possible sources through subgroup and sensitivity analyses. If heterogeneity remains unexplained and pooling is deemed inappropriate, a narrative synthesis will be undertaken, and results will be presented descriptively in tables and text.

3.3.7 Assessment of reporting bias

Reporting bias will be assessed using funnel plots and Egger's test when ≥ 10 studies are available; otherwise, the risk of selective outcome reporting will be discussed narratively.(9)

3.3.8 Data Synthesis

Findings of the studies will be synthesized under the domains of study design, type of intervention, outcome measures.

4. Results

The systematic review will follow PRISMA 2020 guidelines. As this is a protocol, no results are available at this stage. The review is expected to identify and analyze studies evaluating Ayurveda-based interventions for chronic ulcers. Findings will summarize study designs, diagnostic frameworks, therapeutic approaches, outcome measures—including wound healing, healing rate, unit healing time, epithelialization, neovascularization, antimicrobial activity, and recurrence rate—and safety profiles. The review will highlight the effectiveness, limitations, and research gaps in Ayurvedic ulcer management. A PRISMA 2020 flow diagram outlining the planned study selection process has been included as Figure 1, adapted from Page MJ et al with all decision points represented and numerical fields left blank pending completion of the review process.(10)

5. Discussion

This systematic review aims to synthesize the available evidence on Ayurvedic interventions in the

management of chronic ulcers, thereby contributing to the foundation for developing evidence-informed integrative wound care protocols. By mapping the diagnostic frameworks, therapeutic modalities, and clinical outcomes reported across diverse study designs, the review will highlight areas of consistency, innovation, and divergence in current practice.

However, several methodological and interpretive challenges are anticipated. One of the primary concerns is the expected heterogeneity in the included studies—particularly in terms of patient selection, ulcer types, intervention protocols, outcome definitions, and follow-up durations. Most of the available literature is likely to consist of case reports and observational studies, with a relatively small number of randomized controlled trials, limiting the ability to perform meta-analyses or draw high-certainty conclusions.

Additionally, there is a lack of standardized diagnostic criteria and outcome assessment tools across the Ayurvedic and integrative studies on chronic ulcers. This variability may affect the comparability of findings and the generalizability of results to broader clinical contexts. Disparities in how classical Ayurvedic indications are interpreted and applied in contemporary practice further complicate efforts to systematically classify interventions or stratify outcomes by ulcer type or disease severity.

Despite these limitations, the review will offer critical insights into the strengths and gaps of current clinical evidence and pave the way for designing more robust clinical trials, developing standardized assessment tools, and formulating context-appropriate integrative management guidelines for chronic ulcers.

6 Conclusion

This systematic review will provide clear insights into the Ayurvedic management of chronic ulcers. It will show the effectiveness of different approaches and point out gaps in evidence to guide future research.

7 Limitations

This review may encounter several limitations. Heterogeneity in Ayurveda interventions, encompassing both oral and topical modalities, may limit the feasibility of pooled analyses. Differences in diagnostic definitions and assessment methods are anticipated, which could introduce variability across studies. Many published reports are expected to focus primarily on wound healing, with limited reporting of other relevant outcomes such as epithelialization, neovascularization, or recurrence. The evidence base is also likely to be dominated by case studies and case series, with relatively few randomized controlled trials, thereby restricting the overall quality and generalizability of findings. Finally, the restriction to English-language publications may lead to language bias.

8 Acknowledgement

None

9 Conflict of interest

None

10 References

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Supplementary Files

Figures

PRISMA 2020 Flow Diagram.

