International Research Journal of Ayurveda & Yoga Vol. 9(4), pp. 41-46, April, 2026
Available online at http://irjay.in
ISSN: 2581-785X
DOI: 10.47223/IRJAY.2026.90408

REVIEW ARTICLE

Conceptual and Clinical Review of *Paribhadradi* Formulation in *Janu Sandhigata Vata* (Knee Osteoarthritis)

Chander Shekhar Sharma[1]*, Rakesh Pawar[2]

[1]PhD Scholar, Department of Kayachikitsa, Desh Bhagat University, Mandi Gobindgarh, Punjab, India.
[2]Professor, Department of Kayachikitsa, Desh Bhagat University, Mandi Gobindgarh, Punjab, India.

ARTICLE INFO

Article history:
Received on: 17-03-2026
Accepted on: 19-04-2026
Published on: 30-04-2026

Key words:
Ayurveda,
External Therapy,
Janu Sandhigata Vata,
Knee Joint,
Ointment,
Osteoarthritis,
Paribhadradi Formulation,
Pralepa,
Vata Vyadhi

ABSTRACT

Background: Janu Sandhigata Vata, described in Ayurveda, closely correlates with knee osteoarthritis (OA), a prevalent degenerative joint disorder affecting mobility and quality of life, especially in the aging population. Classical Ayurvedic management emphasizes both internal and external therapies, among which topical applications like pralepa hold significant importance.

Objective: The objective of the study was to conceptually and clinically review the therapeutic potential of Paribhadradi formulation in the management of Janu Sandhigata Vata, with special emphasis on its application in both classical pralepa and modern ointment forms.

Materials and Methods: This review is based on an extensive analysis of classical Ayurvedic texts such as Charaka Samhita, Sushruta Samhita, and Madhava Nidana, along with contemporary clinical studies and published literature indexed in Google Scholar. The conceptual framework includes etiopathogenesis (Samprapti), clinical features, and therapeutic principles, while clinical evidence from Ayurvedic and modern studies was critically analyzed.

Results: The review indicates that Sandhigata Vata is primarily a Vata-dominant disorder involving Dhatukshaya and degeneration of joint structures. External therapies such as pralepa and ointments play a crucial role in localized management by providing Vata-shamana, anti-inflammatory, and analgesic effects. The Paribhadradi formulation, composed of Vata-pacifying and Shothahara drugs, demonstrates promising therapeutic potential. Clinical studies on topical applications and herbal formulations show significant improvement in pain, stiffness, and joint function, supporting their efficacy in knee OA.

Conclusion: Paribhadradi pralepa and its ointment form represent an effective and practical therapeutic approach for the management of Janu Sandhigata Vata. The integration of classical principles with modern pharmaceutical adaptation enhances patient compliance and therapeutic outcomes. However, further well-designed clinical trials are required to establish standardized protocols and strengthen scientific validation.

1. INTRODUCTION

Janu Sandhigata Vata, which is a degenerative disorder of the knee joint, is clinically associated with osteoarthritis (OA). It is marked with symptoms such as pain (Sandhishoola), swelling (Shotha), stiffness, and limited movement, which greatly deteriorate the quality of life (QOL) of its sufferers. As the life expectancy increases and lifestyles change, the incidence of knee OA is on the increase all over the world, making it a significant issue of concern to the population. Ayurveda identifies the aggravation of Vata Dosha to be the major cause of this condition, which results in the degeneration of joint structures and the loss of normal joint functioning.

Treatment of knee OA now mainly aims at symptomatic management with analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), and surgery in severe cases. Nevertheless, these methods can be temporary and can be linked to negative consequences. By comparison, Ayurvedic management considers a holistic approach, including internal drugs

Corresponding Author:
Chander Shekhar Sharma, PhD Scholar,
Department of Kayachikitsa, Desh Bhagat University,
Mandi Gobindgarh, Punjab, India.
Email: shekhars76@gmail.com

but external treatments, including Lepa (topical application), Pralepa, Abhyanga, and local treatment, such as Janubasti. The aim of these therapies is not only to treat the symptoms but the underlying cause, which is balancing Doshas and tissue regeneration.[1]

A number of clinical trials have indicated that Ayurvedic treatments are effective in treating Janu Sandhigata Vata. Indeed, a comparative clinical trial by Gupta[2] showed that Dashanga Guggulu and Shothaghna Lepa have a therapeutic value in alleviating pain and inflammation in individuals with OA. In a similar instance,[3] assessed the effectiveness of Ekangdhara and Janubasti in combination with Sahacharadi Taila and found a significant improvement in the mobility of the joints and the presence of symptoms. Besides, a placebo-controlled study of Nirgundi Mula Choorna[4] demonstrated positive outcomes in the reduction of clinical symptoms in the disease. Moreover, clinical observations, which are cited by other researchers, also confirm the effectiveness of Ayurvedic formulations in the management of knee OA with the help of systemic and local treatment.[5]

Among the Ayurvedic preparations, Paribhadradi formulation has a potential value because it possesses Vata-shamaka and anti-inflammatory effects. When administered in different forms such as pralepa and ointment, it may provide localized as well as sustained therapeutic effects. Although it has classical applicability, little converged literature has been available to assess its conceptual framework and clinical effectiveness in Janu Sandhigata Vata. Thus, it is important to review Paribhadradi formulation in detail, its pharmacological activity, application method, and clinical applicability.

The purpose of this review paper is to critically evaluate the conceptual framework and available clinical evidence on the use of Paribhadradi formulation in the management of Janu Sandhigata Vata (knee OA) with particular reference to its use as pralepa and ointment. The study aims at determining the relevance of Ayurveda classical principles in modern clinical research by combining Ayurveda with modern clinical evidence to come up with a safe and effective therapeutic agent against knee OA.

1.1. Objectives of the Study

The present review paper was undertaken with the following objectives:

I. To analyze the conceptual framework of Janu Sandhigata Vata in relation to knee OA
II. To evaluate the role of Ayurvedic external therapies, particularly Pralepa and ointment, in its management
III. To assess the clinical evidence of Ayurvedic interventions in knee OA
IV. To explore the therapeutic potential of Paribhadradi formulation in the management of Janu Sandhigata Vata.

2. REVIEW OF LITERATURE

The study assessed the impact of Paribhadradi Pralepa on Sandhigata Vata.[6] The sixty participants in the clinical experiment ranged in age from 35 to 60. The prepared pralepa should be applied nightly for a continuous 14 days. Before, during, and after therapy, a specially developed grading scale was used to assess the severity of symptoms. After a 2-week follow-up period, we also evaluated the improvement in clinical aspects. Statistical analysis revealed a statistically significant improvement in symptom severity. Conclusion: Paribhadradi pralepa is useful for Sandhigata Vata control.[6]

A study evaluated the efficacy and safety of topical and oral NSAIDs for the treatment of OA. They identified 8 randomized controlled trials (RCTs) (2096 patients with OA), for evaluation and revealed that, in general, topical and oral NSAIDs presented with similar efficacies for the treatment of OA. The Western Ontario and McMaster OA Index for assessing pain relief in OA patients was (standardized mean difference [SMD] 0.07; 95% confidence interval [CI]−0.02, 0.17), and Visual Analog Scale was (SMD −0.01; 95% CI −0.02, 0.18), and improved stiffness in OA patients (SMD 0.09; 95% CI 0.03, 0.20). Topical NSAIDs are as effective as oral NSAIDs for the treatment of OA, and both topical and oral NSAIDs are equally effective in reducing pain and improving physical function in OA patients. In terms of safety, a larger number of samples is still needed to determine if there are any differences in the safety profile of topical or oral NSAIDs.[7]

A study evaluated the effects of administering 40 mg of triamcinolone acetonide via intra-articular (IA) injections every 3 months on knee pain and cartilage degradation.[8] The 2-year, randomized, placebo-controlled, double-blind trial of IA triamcinolone versus saline for 140 symptomatic knee OA and ultrasonic synovitis patients. The longitudinal repeated outcome measurements were examined using random intercept mixed-effects regression models. Tufts Medical Center began enrolling symptomatic knee OA patients with Kellgren-Lawrence grades 2 or 3 according to American College of Rheumatology criteria on February 11, 2013. All patients finished the experiment by January 1, 2015. Use IA triamcinolone (n = 70) or saline (n = 70) every 12 weeks for 2 years. McMaster and Western Ontario Universities OA index every three months (Likert pain subscale range, 0 [no pain] to 20 [severe pain]; minimal clinically meaningful improvement, 3.94). Among 140 randomized individuals (mean age, 58 [standard deviation, 8] years, 75 women [54%]), 119 (85%) completed the study. IA triamcinolone induced more cartilage volume loss than saline, with a mean change in index compartment cartilage thickness of −-.21 mm versus −0.10 mm (95% CI, −0.20 to −0.03 mm) and no significant difference in pain (−1.2 vs. −1.9; −0.6; 95% CI, – The triamcinolone group had 5 adverse events (AE), while the saline group had 3 and had a modest increase in hemoglobin A1c levels (−0.2%; 95% CI, −0.5% to −0.007%). Symptomatic knee OA patients treated with IA triamcinolone for 2 years lost more cartilage volume than saline, although knee discomfort did not improve. The study does not support this treatment for symptomatic knee OA.[8]

The most effective type of exercise therapy for knee OA with regard to pain, stiffness, joint function, and QOL was identified in a study.[9] A total of 39 studies (n = 2646 participants) were included. Most of the studies failed to blind participants and researchers, resulting in a high risk of performance bias. Significantly worse Western Ontario and McMaster Universities OA Index (WOMAC)-Pain scores were seen in controls compared with all exercise interventions except AE (WMD [95% CI]: CY, –4.45 [–5.69 to –3.20]; RT, –4.28 [–5.48 to –3.07]; TC, –4.20 [–5.37 to –3.04]; and YG, –0.57 [–1.04 to –1.04]), and worse scores were seen in controls compared with YG regarding WOMAC-Stiffness (WMD, –1.40 [95% CI, –2.45 to –0.34]) and WOMAC-Function (WMD, –0.49 [95% CI, –0.95 to –0.02]). According to the SUCRA, CY was the most effective for improving WOMAC-Pain (80.8%) and Six-Minute Walk Test (6-MWT) (76.1%); YG was most effective for improving WOMAC-Stiffness (90.6%), WOMAC-Function (77.4%), KOOS-Activities of Daily Living (72.0%), and KOOS-QOL (79.1%); AE was the most effective regarding visual analogue scale (VAS) pain (77.2%) and KOOS-Pain (64.0%); and RT was the most effective regarding KOOS-Symptoms (84.5%). All 5 types of exercise were able to ameliorate KOA. AE (for pain relief) and YG (for joint stiffness, limited knee function, and QOL) were the most effective approaches, followed by RT, CY, and TC.[9,10]

In another research study, the knee muscle-strengthening impact of Myostaal® liniment (Solumiks Herbaceuticals Limited, Mumbai, India) to physiotherapy alone in knee OA patients for 90 days. Secondary objectives evaluated changes in the total WOMAC score, WOMAC Subscale scores, 6-MWT distance, single leg stance test duration, VAS score, and AE from baseline to Day 90 between the two groups. The 90-day study involved 70 participants in Group A (Myostaal liniment plus physiotherapy) or Group B (physiotherapy alone). Group A received twice-daily liniment. Analyses were conducted using Case Report Forms and one-way analysis of variance or Friedman test for within-group comparisons and Mann–Whitney test for between-group comparisons, with significance set at $P < 0.05$. Compared to Group B (usual therapy), Group A (test drug group) had significantly higher knee muscle strength (index knee) at Visit 3 ($P < 0.05$; Day 60 ± 3) and Visit 4 ($P < 0.001$; Day 90 ± 3). Only Group A showed a substantial gain in knee muscle strength ($P < 0.001$ at Day 90 ± 3) for the non-index knee. Compared to Visit 1, Group A showed a significant decrease in total WOMAC score from Visit 2 ($P < 0.01$; Day 30 ± 3) forward. Visit 3 ($P < 0.001$; Day 60 ± 3) and Visit 4 ($P < 0.001$; Day 90 ± 3) had considerably lower ratings than Visit 2 (Day 30 ± 3). In knee OA patients, massage with Myostaal liniment added to PT increased knee muscle strength and joint functionality. As a supplement, Myostaal liniment relieved pain better.

In the year 2023, a study to evaluate the efficacy and safety of E-PR-01, a unique Vitex negundo and Zingiber officinale mix, on knee joint pain was conducted. 40 adults aged 20–60 with pain scores ≤30 mm at rest and ≥60 mm post-exertion on a 100-mm VAS were randomized 1:1 to receive E-PR-01 (200 mg twice day) or placebo for 5 days. The main analysis compared the time to achieve significant pain relief (MPR) (≥40% reduction in post-exertion pain VAS score from baseline) after a single dose of intervention to placebo on day 1. Post-exertion pain intensity difference (PID) at 2-, 3-, and 4-h and time-weighted sum of PID (SPID) over 4 h post-single dose on day 1; post-exertion VAS score at 4 h post-intervention on day 5; percentage of responders on day 1; and physical efficiency as measured by total exercise duration after single dose of IP compared to placebo were After a single dose on day 1, 32.50% of E-PR-01 individuals achieved MPR in 3.38 h, while none of the placebo group did. Significant variations in PID (−23.58 vs. 2.45 mm) and SPID (−67.48 vs. −0.08 mm) were seen between E-PR-01 and placebo at 4 h on day 1. Compared to 37.5% in the placebo group, 95% in the IP group received pain alleviation within 2 h. One dose of E-PR-01 reduced exercise-induced knee joint discomfort within 4 h statistically and clinically.[11]

A study evaluated Rasnadi Gutika (RG) and Chandrakala Lepa (CKL) for Janusandhigata Vata [OA knee]. Both the Central Ayurveda Research Institute in Bhubaneswar, Odisha, and the Regional Institute in Lucknow, Uttar Pradesh, were used for the study. RG and CKL were given to 120 primary OA knee joint patients aged 40–75. The therapy lasted 12 weeks, with follow-up on days 14, 28, 42, 56, 70, and 84. RG was given orally in 1 g twice a day with tepid water, and CKL 10 g was applied locally twice a day for 12 weeks. Pre- and post-therapy assessments included chief complaints, such as joint pain on movement, rest, restricted joint, crepitus, swollen joint, stiffness, and bony enlargement; total WOMAC score; and the World Health Organization (WHO) QOL BREF score. On the 84th day of follow-up, the major outcome measure, the WOMAC score, improved ($P = 0.001$). All aspects, including pain, stiffness, and functioning, improved. Physical health, physiological and social interactions, and environmental aspects of the WHO QOL BREF score for QOL were similarly affected ($P = 0.0001$). In the trial, no adverse medication reactions or incidents were documented. RG oral and CKL external treatments for OA knee are beneficial. Further clinical studies with larger samples may be needed to confirm this study's findings.[12]

Another study refined and strengthened the OARSI guidelines by formulating expert-consensus, patient-centered treatment recommendations for knee, hip, and polyarticular OA.Core Knee Treatments Education and structured land-based exercise regimens with or without dietary weight management were part of OA. Arthritis education and land-based exercise were key Hip and Polyarticular OA treatments. Knee OA (Level 1A) patients were advised to use topical NSAIDs. For people with gastrointestinal issues, COX-2 inhibitors were Level 1B and NSAIDs plus proton pump inhibitors Level 2. Oral NSAIDs were not advised for weak or cardiovascular patients. IA corticosteroids, hyaluronic acid, and aquatic exercise were Level 1B/Level 2 therapies for Knee OA, depending on comorbidity, but not for Hip or Polyarticular OA. APAP was conditionally not advised (Level 4A and 4B), whereas oral and transdermal opioids were definitely not recommended (Level 5). A treatment algorithm was created to facilitate clinical decision-making for various patient profiles utilizing prescribed treatments as input for each decision node. Knee, hip, and polyarticular OA patients can use these guidelines for complete, patient-centered treatment. The algorithm will let OA patients make personalized treatment decisions.[13]

In another multicenter randomized, controlled, open-label trial, knee OA patients in Germany were treated in two hospital clinics and two private outpatient clinics according to ACR criteria. Multi-modal Ayurvedic or conventional care was given over 12 weeks with 15 treatments. The 12 weeks WOMAC Index change was the primary result. WOMAC subscales, the pain disability index, a pain experience scale, numeric rating scales for pain, sleep, quality-of-life, mood, rescue drug use, and safety issues were secondary outcomes. 151 participants (77 Ayurveda, 74 conventional) were included. Ayurveda significantly improved the WOMAC Index from baseline to 12 weeks (mean difference 61.0 [95% CI: 52.4; 69.6]) compared to the conventional group (32.0 [95% CI: 21.4; 42.6]), with a significant difference ($P < 0.001$) and a clinically relevant effect size (Cohen's d 0.68 [95% CI: 0.35; 1.01]). At week 12, all secondary outcomes showed similar trends. Six- and 12-month follow-ups showed effects. Results reveal Ayurvedic treatment reduces knee OA symptoms. Further research should validate the effect's magnitude and explain the relevance of treatment components and non-specific effects.[14]

3. MATERIALS AND METHODS

This paper is a narrative review that seeks to examine the conceptual and clinical nature of Paribhadradi formulation in the treatment of Janu Sandhigata Vata (knee OA) and more specifically, how it has been used in forms of pralepa and ointment.

Both ancient ayurvedic literature and modern science were searched through a comprehensive literature search. Classical sources were consulted to comprehend the main ideas of Janu Sandhigata Vata, its etiology (Nidana), pathogenesis (Samprapti), and principles of its management (Chikitsa). Furthermore, published clinical trials, dissertations, and research articles on the topic OA and Ayurvedic interventions were systematically reviewed.

Secondary data were gathered through different sources such as Google scholar, PubMed, AYUSH Research Portal, and institutional repositories. The keywords searched were Janu Sandhigata Vata, OA of knee, Ayurvedic management, Pralepa, Lepa, Ointment, and Paribhadradi formulation. The inclusion of relevant studies was

based on the need to evaluate the clinical effectiveness of Ayurvedic therapies in knee OA.

Inclusion criteria included published and unpublished studies (including theses and dissertations) dealing with Ayurvedic management of Janu Sandhigata Vata or knee OA, especially those that involved the use of external therapies, such as Lepa, Pralepa, and similar formulations. The literature that was not directly related to OA or had an insufficient methodological clarity was eliminated.

The data obtained were analyzed and synthesized critically to determine the therapeutic potential of Paribhadradi formulation. It was conducted using conceptual analysis, which was conducted according to Ayurvedic principles, and clinical evidence, which was interpreted to comprehend its practical usefulness. The results are reported in a descriptive format in order to give a comprehensive picture of both theoretical and clinical approaches.

4. OBSERVATIONS AND RESULTS

4.1 Conceptual Understanding of Janu Sandhigata Vata

According to the review of the classical Ayurvedic texts and modern literature, it is indicated that Janu Sandhigata Vata is basically a degenerative disorder which is brought about by aggravated Vata Dosha, which causes degeneration of joint tissues. Pain, swelling, stiffness, and crepitus are the key clinical manifestations that are closely related to the characteristics of knee OA in modern medicine. Research has established that OA is typified by the degeneration of cartilages, alterations in the subchondral bones, and synovial inflammation, which is also in line with the Ayurvedic principle of Dhatukshaya and Vata vriddhi.

4.2. Role of Pralepa and Ointment in Management

The results of the literature review indicate that the external treatments, such as pralepa (thin application of medicated paste) and ointment, are important in controlling the symptoms of Janu Sandhigata Vata. These treatments are local as they decrease inflammation, enhance blood flow, and relieve pain.

It is said that topical applications result in increased drug absorption across the skin surface and localized therapy with no systemic side effects. The research conducted by Gupta[14] showed that Shothaghna Lepa minimized joint pains and swelling in OA patients significantly. On the same note, Janubasti and oil applications are external interventions that have been reported to be effective in enhancing the mobility of the joint and decreasing stiffness.

4.3. Clinical Evidence of Ayurvedic Interventions

Clinical studies analysis shows that Ayurvedic interventions are suitable in the treatment of knee OA. Gupta[15] stated that a combination of internal and external therapies resulted in a significant improvement in pain and inflammation. Ekangdhara and Janubasti therapy resulted in better joint functioning and decreased stiffness.

A Nirgundi Mula Choorna-controlled placebo study by Pandit[16] showed statistically significant symptom relief. F, the efficacy of Ayurvedic formulations in the management of the symptoms and QOL of patients with Janu Sandhigata Vata is supported by clinical findings of Paradkar *et al*.

Modern evidence corroborates this idea, as well as points to the use of herbal anti-inflammatory agents and topical treatment as a possibly helpful step in the treatment of OA.

4.4. Therapeutic Potential of Paribhadradi Formulation

The analysis reveals that Paribhadradi formulation has the properties of Vata-shamana (pacifying Vata), anti-inflammatory, and analgesic. As either pralepa or ointment, it can be of immediate and prolonged service by local effect.

Even though there are few direct clinical trials on Paribhadradi formulation, evidence on similar Ayurvedic formulations and external therapies indicates that it might be effective in reducing pain, swelling, and enhancing joint functioning. Its pharmacological characteristics of its constituent drugs also explain its use in the treatment of degenerative joint disorders.

5. DISCUSSION

In the current review, it is evident that the Ayurveda-defined concept of Janu Sandhigata Vata is very close to the current medical knowledge of knee OA, not only in terms of etiology but also in clinical manifestation. “Ayurvedic principle of Vata aggravation as a degenerative (Dhatukshaya) effect is in agreement with modern knowledge of OA as a progressive degenerative joint disease, which encompasses cartilage degradation, synovial inflammation, and structural alterations of the joints. Such ontological resemblance allows the Ayurvedic principles to be more relevant in the interpretation and management of musculoskeletal disorders in contemporary clinical contexts”[17]

The results of this review demonstrate the importance of external therapies, including pralepa and ointment in the treatment of knee OA. These therapies provide localized treatment, which is very useful in such conditions as Janu Sandhigata Vata when the pathology is limited to certain joints. Direct absorption of active phytoconstituents through herbal pastes and medicated ointments is achieved through the use of transdermal drug delivery, and results in anti-inflammatory and analgesic effects. The topical therapies are also supported by the modern research as an effective mean of pain relief in OA, as they can be used with a minimum of side effects on the system as oral medications.[18]

The other notable fact of the literature reviewed is the increased evidence in favor of integrative and non-pharmacological methods in the management of OA. Traditional and commonly used therapies like NSAIDs and corticosteroids have their positive effects in the short run, but have negative long-term effects. “Conversely, Ayurvedic treatments, such as herbal preparations and external treatments are less risky and provide long-term effects.” This aligns with the existing international guidelines that promote the use of multimodal and patient-centered interventions to treat chronic musculoskeletal disorders.[19]

Specifically, regarding Paribhadradi formulation, the review indicates that it has potential application in therapy because it is likely to possess Vata-shamaka, anti-inflammatory, and analgesic effects. It could be used as a pralepa and ointment, which could lead to short-term symptomatic relief and functional improvement in the long term. Whereas there are no direct clinical data on this particular formulation, research on related herbal extracts suggests that plant-based extracts contain bioactive compounds that can regulate the inflammatory pathways and oxidative stress, which play a major role in the progression of OA.

Furthermore, the combination of traditional Ayurvedic wisdom and modern clinical studies offers an interdisciplinary approach to explaining and treating knee OA. Nevertheless, one of the limitations that were found in this review is the absence of standardized clinical

trials that directly compare Paribhadradi formulation. The majority of the studies that are available are concerned with other formulations or generalized Ayurvedic therapies. Thus, the effectiveness of it needs well-constructed randomized controlled trials that would confirm its effect and standardize the dosage forms (pralepa and ointment) and lay down the evidence-based protocols.

In general, the discussion has shown that Ayurvedic external therapies, especially in specific formulations such as Paribhadradi, could have a significant potential in the management of Janu Sandhigata Vata. Incorporation of these therapies into conventional clinical practice can help in providing safer, cost-effective, and holistic control of knee OA.

6. CONCLUSION

The review article states that the "conceptual and clinical correlation between Janu Sandhigata Vata, as outlined in Ayurveda, and knee OA, which is a common degenerative joint disease, is strong." The Ayurvedic concept of Vata aggravation and Dhatukshaya is a detailed concept to explain the pathogenesis and progress of the disease that fits in the contemporary biomedical views.

The literature review shows that Ayurvedic management, especially external administration of Ayurvedic remedies such as pralepa and ointment, is effective in reducing the symptomatic pain, swelling, and stiffness. These therapies have the benefit of local activity, enhanced patient compliance, and low systemic side effects, so they can be used in the long term to manage chronic diseases such as OA.

When applied in the form of pralepa and ointment, Paribhadradi formulation has the potential to become a good therapeutic agent because of its likely anti-inflammatory, analgesic, and Vata-pacifying effects. Despite the lack of direct clinical evidence to support this formulation, it can be suggested that it is effective in enhancing the QOL and joint functioning because of the information obtained with the help of similar Ayurvedic interventions and pharmacological principles.

Nonetheless, another critical gap, which is also revealed by the review, is the lack of standardized clinical research on Paribhadradi formulation. Thus, additional well-conceived clinical trials are necessary to confirm its efficacy, necessitate standardization, and make it a part of the evidence-based practice.

To sum up, Paribhadradi formulation can be a safe, effective, and holistic, non-toxic, treatment in the treatment of Janu Sandhigata Vata (knee OA), particularly when used as pralepa and ointment. Its application into modern healthcare may lead to better patient outcomes and an effective alternative to the traditional form of treatment.

7. FUTURE SCOPE

The current review indicates the therapeutic possibilities of Paribhadradi formulation in the treatment of Janu Sandhigata Vata (knee OA); nevertheless, there are a few areas that need to be investigated further. The future studies ought to be based on well-designed RCTs to determine the clinical efficacy and safety of Paribhadradi formulation in the pralepa and ointment forms. "The formulation (dosage, preparation method, duration of application, and frequency of use) needs to be standardized to provide reproducibility and broader clinical acceptance."

Besides that, pharmacological and phytochemical research is required to determine the active constituents and the mode of action, especially its anti-inflammatory, analgesic, and cartilage-protective properties. A direct comparison of Paribhadradi formulation with conventional treatments, which are considered standard or other Ayurvedic formulations, can also help in supporting its evidence base.

Integrative research methods can also be applicable (Ayurvedic therapies and modern rehabilitation methods, including physiotherapy) to improve the treatment results. Also, long-term follow-up studies of the QOL, functional improvement, and disease progression would be useful in determining its long-term benefits.

8. ACKNOWLEDGMENTS

Nil.

9. AUTHORS' CONTRIBUTIONS

All authors give equal contribution in making of this manuscript.

10. FUNDING

Nil.

11. ETHICAL STATEMENT

Ethical approval was not required for this study as it is a review study.

12. CONFLICT OF INTERESTS

The authors declare no conflicts of interest regarding the publication of this paper.

13. DATA AVAILABILITY STATEMENT

The data analyzed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible through databases.

14. PUBLISHERS NOTE

This journal remains neutral with regard to jurisdictional claims in published institutional affiliations.

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How to cite this article:
Sharma CS. Pawar R. Conceptual and Clinical Review of Paribhadradi Formulation in Janu Sandhigata Vata (Knee Osteoarthritis). IRJAY. [online] 2026;9(4):41-46.
Available from: https://irjay.in
DOI link- https://doi.org/10.47223/IRJAY.2026.90408