



AYURVEDIC MANAGEMENT OF CHRONIC BILATERAL KNEE OSTEOARTHRITIS AND LOW BACK PAIN IN AN ELDERLY FEMALE: A CASE REPORT

Sahil Khan^{1*}, Kajal Sharma², Mohd. Danish³, Anas Rais⁴

¹Managing Director, Atiya Herbs Pvt. Ltd., Karol Bagh, Delhi.

²Director, Atiya Herbs Pvt. Ltd., Karol Bagh, Delhi.

³Senior Manager, Atiya Herbs Pvt. Ltd., Karol Bagh, Delhi.

⁴Consultant, Atiya Herbs Pvt. Ltd., Karol Bagh, Delhi.

Article Received on 15 May 2026,
Article Revised on 03 June 2026,
Article Published on 10 June 2026,

<https://doi.org/10.5281/zenodo.20642356>

*Corresponding Author

Sahil Khan

Managing Director, Atiya Herbs
Pvt. Ltd., Karol Bagh, Delhi.



How To Cite This Article: Sahil Khan^{1*}, Kajal Sharma², Mohd. Danish³, Anas Rais⁴. (2026). Ayurvedic Management of Chronic Bilateral Knee Osteoarthritis and Low Back Pain in an Elderly Female: A Case Report. World Journal of Pharmacy and Pharmaceutical Sciences, 15(6), 1694-1704.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Background: Osteoarthritis of the knee and chronic low back pain are among the most common musculoskeletal disorders affecting elderly individuals. Progressive degeneration of joints leads to pain, stiffness, reduced mobility, and impaired quality of life. In Ayurveda, such conditions can be correlated with Sandhigata Vata and Katigata Vata, resulting from Vata aggravation and age-related Dhatukshaya. This case report describes the management of chronic bilateral knee pain and low back pain in an elderly female using a herbal treatment regimen. **Case Presentation:** A 66-year-old female presented with chronic bilateral knee pain, low back pain, stiffness, difficulty in movement, and obesity. The patient was a known case of hypertension and was receiving regular allopathic medication. Clinical assessment revealed persistent musculoskeletal symptoms affecting daily activities and

functional mobility. **Intervention:** The patient was managed with a combination of herbal formulations including Gond Siyah Powder, T-Care Capsule, Aloe Plus Capsule, Boswellia serrata Capsule, and S-Care Capsule, along with dietary and lifestyle recommendations. **Outcome:** Progressive reduction in pain, stiffness, and movement-related discomfort was observed during follow-up. Improvement in functional mobility and overall quality of life was reported. No adverse events were noted during treatment. **Conclusion:** The present case

suggests that an integrative herbal approach may provide symptomatic relief and improve quality of life in elderly patients suffering from chronic osteoarthritis and low back pain. Further clinical studies are warranted to validate these observations.

KEYWORDS: Osteoarthritis, Sandhigata Vata, Katigata Vata, Knee Pain, Low Back Pain, Ayurveda, Herbal Medicine.

INTRODUCTION

Osteoarthritis (OA) is a multifactorial joint disease marked by the gradual deterioration of articular cartilage, accompanied by changes in the underlying subchondral bone, synovial inflammation, and the formation of osteophytes.^[1,2] This progressive degeneration leads to symptoms such as chronic pain, joint stiffness, swelling, and a decline in functional capacity, severely impacting patients' daily activities and overall quality of life.^[3,4] Among the various joints affected, the knee is particularly susceptible due to its weight-bearing role and complex biomechanical demands.^[5] The prevalence of knee OA increases with age, making it a leading cause of disability in the elderly population worldwide.^[6,9]

Worldwide, the prevalence of OA varies by region, age, and diagnostic criteria but generally increases with age.^[8,9] It is estimated that approximately 10–15% of adults aged 60 years and older suffer from symptomatic OA, making it a leading cause of disability and reduced quality of life in the elderly population.^[9,10] Knee osteoarthritis is particularly common, accounting for a significant proportion of OA cases due to the knee's weight-bearing function and biomechanical stress.^[5]

In India, the prevalence of osteoarthritis is also substantial, with studies indicating a higher burden among older adults, especially women.^[11] Estimates suggest that about 22–39% of the Indian elderly population experiences symptomatic OA, with knee OA being the most frequent form.^[12,13] Factors such as genetic predisposition, lifestyle, obesity, and occupational stress contribute to this prevalence. The growing elderly population in India underscores the increasing public health challenge posed by OA, necessitating effective management strategies to mitigate its impact on mobility and quality of life.

In addition to localized joint pathology, knee osteoarthritis often coexists with chronic low back pain, creating a compounded burden for affected individuals. This comorbidity can be attributed to several interrelated factors, including biomechanical alterations caused by joint

degeneration, increased body mass index contributing to mechanical stress, and systemic age-related musculoskeletal changes. Reduced physical activity resulting from pain and mobility limitations further exacerbates muscle weakness and postural imbalances, perpetuating a cycle of pain and dysfunction. Understanding the interplay between knee OA and chronic low back pain is essential for developing comprehensive management strategies that address both conditions simultaneously to improve patient outcomes.

In Ayurveda, the conditions of chronic knee osteoarthritis and low back pain correspond closely to the concepts of Sandhigata Vata.^[14] and Katigata Vata.^[15], respectively. These conditions arise due to the aggravation and localization of Vata Dosha in specific anatomical regions—the joints in Sandhigata Vata and the lumbar spine in Katigata Vata.^[16] This doshic imbalance manifests clinically as pain (Shoola), stiffness (Stambha), crepitus during joint movement, and a notable restriction in the range of motion. The pathophysiology involves the disruption of normal Vata functions, leading to impaired circulation, reduced lubrication of joint structures, and compromised tissue integrity, which parallels the degenerative changes seen in osteoarthritis.

Therapeutic management in Ayurveda focuses on pacifying the aggravated Vata Dosha to alleviate symptoms and halt disease progression. This includes strategies to reduce inflammation, enhance tissue nourishment, and restore joint function. Treatments often incorporate herbal formulations known for their anti-inflammatory, analgesic, and rejuvenating properties, alongside lifestyle modifications aimed at improving circulation and musculoskeletal balance. The case report highlights the clinical outcome of an elderly female patient with chronic knee osteoarthritis and low back pain who was treated with a tailored combination of such herbal medicines.

Patient information

A 66-year-old female patient, presented with chronic bilateral knee joint pain and low back pain of several years' duration. The pain was associated with stiffness, difficulty in walking, reduced mobility, and discomfort during routine daily activities. The patient also had obesity, which further aggravated her musculoskeletal symptoms and functional limitations. She was a known case of hypertension and was on regular allopathic medication for its management. There was no history of recent trauma, fracture, or surgical intervention related to the present complaints. Despite ongoing conventional treatment, the patient continued to experience persistent knee pain and low backache, leading her to seek herbal management for

symptomatic relief and improvement in quality of life. At presentation, the symptoms had significantly affected her physical functioning, ambulation, and overall well-being.

Clinical Findings

On clinical evaluation, the patient appeared obese and experienced difficulty in walking due to persistent bilateral knee pain and low back pain. Pain was aggravated by prolonged standing, walking, climbing stairs, and weight-bearing activities, while partial relief was obtained with rest. Examination revealed tenderness around both knee joints along with painful and restricted movements. Crepitus was elicited during flexion and extension of the knees, suggestive of degenerative joint changes. Low back examination demonstrated tenderness over the lumbosacral region with restriction of lumbar movements, particularly forward bending and extension. The patient reported stiffness after periods of inactivity and difficulty in performing routine household activities.

General examination revealed elevated body weight with a body mass index consistent with obesity. Blood pressure was maintained under medication. No evidence of acute inflammation, joint deformity, neurological deficit, bowel-bladder involvement, or systemic inflammatory disease was observed. The overall clinical picture was suggestive of degenerative musculoskeletal pathology involving the knee joints and lumbar spine, causing significant functional impairment and reduced quality of life.

Diagnostic assessment

The diagnosis was established based on detailed clinical history, physical examination, and review of available medical records. The patient presented with chronic bilateral knee pain, low back pain, stiffness, difficulty in walking, and reduced functional capacity. Clinical examination revealed tenderness of both knee joints, crepitus on movement, restricted range of motion, and lumbar tenderness with painful spinal movements. The chronic nature of symptoms, obesity, and age-related degenerative changes suggested an underlying osteoarthritic process involving the knee joints along with degenerative changes in the lumbar spine.

Routine laboratory investigations were performed to assess the patient's general health status and to exclude inflammatory, infectious, or metabolic causes of joint pain. Blood pressure was monitored regularly due to the known history of hypertension. No significant

neurological deficits, inflammatory arthropathy, or acute systemic pathology were identified during the assessment.

From an Ayurvedic perspective, the condition was diagnosed as Sandhigata Vata affecting the Janu Sandhi (knee joints) and Katigata Vata involving the lumbar region. The presence of obesity (Sthaulya) was considered a contributory factor leading to increased mechanical stress on weight-bearing joints and aggravation of Vata Dosha, resulting in pain (Shoola), stiffness (Stambha), and restriction of movement (Akunchana-Prasarana Vedana).

Therapeutic Intervention

The patient was managed with a multimodal herbal treatment regimen aimed at reducing pain and stiffness, improving joint mobility, providing musculoskeletal nourishment, and enhancing overall functional capacity. The treatment consisted of Gond Siyah Powder, T-Care Capsule, Aloe Plus Capsule, Boswellia serrata Capsule, and S-Care Capsule. The patient was advised to continue her regular antihypertensive medication and follow dietary and lifestyle recommendations throughout the treatment period.

Table 01: Details of Therapeutic Intervention.

Formulation	Dose	Method of Administration
Gond Siyah Powder	3 g twice daily	Orally with lukewarm milk after meals
T-Care Capsule	1 capsule twice daily	Orally with lukewarm water after meals
Aloe Plus Capsule	1 capsule twice daily	Orally with water after meals
Boswellia serrata Capsule	1 capsule twice daily	Orally with water after meals
S-Care Capsule	1 capsule twice daily	Orally with lukewarm water after meals

Dietary and Lifestyle Advice

The patient was advised to:

- Avoid prolonged standing and excessive physical exertion.
- Follow a balanced, calorie-controlled diet to support weight reduction.
- Avoid excessive intake of fried and processed foods.
- Perform mild stretching and joint mobility exercises regularly.
- Maintain adequate hydration and proper sleep hygiene.

The treatment was continued with periodic follow-up, and the patient demonstrated gradual improvement in pain severity, stiffness, mobility, and overall quality of life without any reported adverse effects.

Follow-Up and Outcomes

The patient was followed up periodically after initiation of treatment to assess changes in pain severity, stiffness, mobility, and overall functional status. Compliance with the prescribed herbal medications was satisfactory throughout the treatment period, and no adverse events were reported.

DISCUSSION

The favorable clinical outcome observed in the present case may be attributed to the synergistic action of the herbal formulations administered, namely Gond Siyah Powder, S-Care Capsule, T-Care Capsule, Aloe Plus Capsule, and *Boswellia serrata* Capsule. These formulations collectively possess anti-inflammatory, analgesic, antioxidant, Rasayana (rejuvenative), and tissue-nourishing properties that are relevant in the management of chronic degenerative musculoskeletal disorders such as osteoarthritis and low back pain.

Gond Siyah Powder contains several potent Rasayana and Balya ingredients including *Withania somnifera* (Ashwagandha), *Chlorophytum borivillianum* (Safed Musli), *Prunus amygdalus* (Almond), *Juglans regia* (Walnut), *Nigella sativa* (Kalonji), *Zingiber officinale* (Shunthi), *Piper nigrum* (Maricha), and *Crocus sativus* (Kesar). Ashwagandha is well known for its anti-inflammatory, adaptogenic, and musculoskeletal strengthening effects.^[17,18], while Safed Musli acts as a rejuvenative agent supporting tissue nourishment and recovery.^[19] Almonds and walnuts provide antioxidant and nutritional support that may contribute to improved joint health.^[20] Ginger and black pepper enhance digestion, bioavailability, and possess anti-inflammatory activity.^[21,22] Together, these ingredients help reduce chronic pain, improve physical endurance, and support musculoskeletal function.

S-Care Capsule contains *Colchicum luteum* (Suranjan), *Terminalia chebula* (Haritaki), *Boswellia serrata* (Shallaki), *Withania somnifera* (Ashwagandha), *Aloe barbadensis* (Aloe vera), *Curcuma longa* (Haridra), *Vitex negundo* (Nirgundi), and *Smilax macrophylla* (Chopchini). Suranjan is traditionally used for painful inflammatory disorders and has demonstrated analgesic and anti-arthritic activity.^[23,24] Shallaki inhibits inflammatory mediators and reduces joint swelling and stiffness.^[25] Haridra possesses potent antioxidant and anti-inflammatory effects through curcuminoids.^[26] Nirgundi is widely recognized for its Vatahara and analgesic properties.^[27,28] The combined action of these herbs likely contributed to reduction in pain, stiffness, and improvement in mobility observed in the patient.

T-Care Capsule includes *Chlorophytum borivilianum*, *Prunus amygdalus*, *Emblica officinalis* (Amalaki), *Pistacia vera*, *Boswellia serrata*, *Withania somnifera*, *Curcuma longa*, and *Crocus sativus*. Amalaki provides strong antioxidant protection and supports tissue regeneration.^[29], while *Pistacia vera* contributes nutritional and anti-inflammatory benefits.^[30] The combination of Ashwagandha, Shallaki, Haridra, and Musli offers both symptomatic relief and nourishment to musculoskeletal tissues. Such actions are particularly relevant in elderly patients where degenerative changes are often associated with age-related tissue depletion.

Aloe Plus Capsule contains *Aloe barbadensis* (Aloe vera), *Emblica officinalis* (Amla), and *Ocimum sanctum* (Tulsi). Aloe vera possesses anti-inflammatory, wound-healing, immunomodulatory, and digestive-supportive properties.^[31,32] Amla is rich in vitamin C and polyphenols that provide antioxidant protection against oxidative stress implicated in osteoarthritis progression.^[33,34] Tulsi exhibits anti-inflammatory, analgesic, and adaptogenic effects.^[35] These ingredients may have contributed to systemic detoxification, reduction of oxidative damage, and enhancement of overall health status.

A separate *Boswellia serrata* Capsule was administered to provide a concentrated source of boswellic acids. *Boswellia* has been extensively studied for osteoarthritis and chronic inflammatory conditions. Boswellic acids inhibit 5-lipoxygenase pathways, reduce leukotriene synthesis, and suppress inflammatory cytokines, leading to decreased pain, improved joint function, and enhanced mobility.^[36,39] The addition of *Boswellia* likely potentiated the anti-inflammatory effects of the overall treatment regimen.

From an Ayurvedic perspective, the patient's condition can be correlated with Sandhigata Vata and Katigata Vata, where aggravated Vata along with age-related Dhatukshaya (tissue degeneration) leads to pain, stiffness, restricted movement, and functional impairment. The administered formulations possess predominantly Vatahara, Shothahara, Vedanasthapana, Balya, and Rasayana properties. These actions help alleviate Vata aggravation, reduce inflammation, nourish Asthi and Majja Dhatu, and improve joint function. The significant reduction in pain and stiffness and improvement in mobility observed during follow-up suggest that the combined herbal intervention effectively addressed both symptomatic and underlying pathological factors contributing to the disease process.

Overall, this case highlights the potential role of a multi-herbal integrative approach in the management of chronic osteoarthritis and low back pain, particularly in elderly patients with obesity and other comorbid conditions.

Patient Perspective

After starting the prescribed herbal treatment, I gradually experienced relief in pain and stiffness. Walking became easier, and I was able to perform my daily activities with greater comfort. The heaviness and discomfort in my joints reduced considerably, and I felt more active and energetic. I also noticed improvement in my overall well-being and quality of life. Importantly, I did not experience any adverse effects during the treatment period. The improvement in my symptoms encouraged me to continue the treatment and follow the advised dietary and lifestyle measures. Overall, I am satisfied with the outcome of the therapy and the improvement in my physical functioning.

CONCLUSION

The intervention helped alleviate Vata aggravation and supported tissue nourishment, thereby improving symptoms of Sandhigata Vata and Katigata Vata. This case suggests that such integrative herbal management may serve as a safe and beneficial approach for chronic degenerative musculoskeletal disorders.

REFERENCES

1. Kapoor M. Pathogenesis of osteoarthritis. In *Osteoarthritis: pathogenesis, diagnosis, available treatments, drug safety, regenerative and precision medicine* 2015. Cham: Springer International Publishing.
2. Yunus MH, Nordin A, Kamal H. Pathophysiological perspective of osteoarthritis. *Medicina*, 2020 Nov., 16; 56(11): 614.
3. Wojcieszek A, Kurowska A, Majda A, Liszka H, Gądek A. The impact of chronic pain, stiffness and difficulties in performing daily activities on the quality of life of older patients with knee osteoarthritis. *International journal of environmental research and public health*, 2022 Dec., 14; 19(24): 16815.
4. Fusco M, Skaper SD, Coaccioli S, Varrassi G, Paladini A. Degenerative joint diseases and neuroinflammation. *Pain Practice*, 2017 Apr., 17(4): 522-32.
5. Vincent KR, Conrad BP, Fregly BJ, Vincent HK. The pathophysiology of osteoarthritis: a mechanical perspective on the knee joint. *PM&R*, 2012 May 1; 4(5): S3-9.

6. Cui A, Li H, Wang D, Zhong J, Chen Y, Lu H. Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. *EClinical Medicine*, 2020 Dec., 1; 29.
7. Kang Y, Liu C, Ji Y, Zhang H, Wang Y, Bi W, Xu J, Guo B. The burden of knee osteoarthritis worldwide, regionally, and nationally from 1990 to 2019, along with an analysis of cross-national inequalities. *Archives of Orthopaedic and Trauma Surgery*, 2024 Jun., 144(6): 2731-43.
8. Scheuing WJ, Reginato AM, Deeb M, Kasman SA. The burden of osteoarthritis: Is it a rising problem?. *Best Practice & Research Clinical Rheumatology*, 2023 Jun., 1; 37(2): 101836.
9. Hawker GA, King LK. The burden of osteoarthritis in older adults. *Clinics in geriatric medicine*, 2022 May 1; 38(2): 181-92.
10. Ling SM, Bathon JM. Osteoarthritis in older adults. *Journal of the American Geriatrics Society*. 1998 Feb., 46(2): 216-25.
11. Daniel RA, Kalaivani M, Aggarwal P, Gupta SK. Prevalence of knee osteoarthritis among elderly persons in India: A systematic review and meta-analysis. *Journal of family medicine and primary care*, 2025 May 1; 14(5): 1675-84.
12. Singh A, Das S, Chopra A, Danda D, Paul BJ, March L, Mathew AJ, Shenoy P, Gotay C, Palmer AJ, Antony B. Burden of osteoarthritis in India and its states, 1990–2019: findings from the Global Burden of disease study 2019. *Osteoarthritis and cartilage*, 2022 Aug., 1; 30(8): 1070-8.
13. Kumar H, Pal CP, Sharma YK, Kumar S, Uppal A. Epidemiology of knee osteoarthritis using Kellgren and Lawrence scale in Indian population. *Journal of Clinical Orthopaedics and Trauma*, 2020 Feb., 1; 11: S125-9.
14. Mohan L. *A Clinical Study to Evaluate the Effect of Veshavara Upanahasweda in Janusandhigatavata WSR to Degenerative Joint Disorder of Knee* (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India))
15. Verma P, Kanaujia S, Pathak AK. Low back pain: the riveting history with unexplored ancient Indian knowledge. *Journal of Indian System of Medicine*, 2022 Oct., 1; 10(4): 256-64.
16. Tripathi M, Singh SS, Saha M. Comprehensive study on the therapeutic application of yoga for the management of osteoarthritis: A systemic review. *Journal of Bodywork and Movement Therapies*, 2024 Oct., 1; 40: 176-83.

17. Vittal M, Vinciguerra M. Enhancing healthspan with Ashwagandha (*Withania somnifera*): a comprehensive review of its multifaceted geroprotective benefits. *Biogerontology*, 2025 Oct., 26(5): 179.
18. Jamnekar PP, Dehankar TJ, Bedre RV, Dharan BG, Agravat B, Agravat H. Ashwagandha as an Adaptogenic Herb: A Comprehensive Review of Immunological and Neurological Effects. *Cureus*, 2025 Nov., 5; 17(11).
19. Dhakad PK, Mishra R, Mishra I, Sharma V. A concise review on therapeutic potential, phytochemistry and traditional applications of safed Musli (*Chlorophytum borivillianum*). *Current Traditional Medicine*, 2024 Aug., 1; 10(4): 138-48.
20. Vinson JA, Cai Y. Nuts, especially walnuts, have both antioxidant quantity and efficacy and exhibit significant potential health benefits. *Food & function*, 2012; 3(2): 134-40.
21. Zuzanna Bober Z, Agnieszka Stępień A, David Aebisher D, Łukasz Ożog Ł, Dorota Bartusik-Aebisher D. Medicinal benefits from the use of Black pepper, Curcuma and Ginger. *European Journal of Clinical and Experimental Medicine*, 2018; (2): 133-45.
22. Srinivasan K. Anti-inflammatory influences of culinary spices and their bioactives. *Food Reviews International*, 2022 Nov., 1; 38: 1-7.
23. Singh S, Nair V, Gupta YK. Antiarthritic activity of Majoon Suranjan (a polyherbal Unani formulation) in rat. *Indian journal of medical research*, 2011 Sep., 1; 134(3): 384-8.
24. Zaidi Z, Nazir S, Bano U, Nasir A, Jabeen F. Suranjan-A potent antiarthritic drug of unani medicine for geriatric population. *J. Gerontol. A Biol. Sci. Med. Sci.*, 2022; 9: 40-3.
25. Gupta PK, Samarakoon SM, Chandola HM, Ravishankar B. Clinical evaluation of *Boswellia serrata* (Shallaki) resin in the management of Sandhivata (osteoarthritis). *AYU (An International Quarterly Journal of Research in Ayurveda)*, 2011 Oct., 1; 32(4): 478-82.
26. Sharma A, Dikshit M, Tiwari RC, Sharma VB. Haridra-curcumin the active principle. *World J. Pharm. Res*, 2021 Apr., 26; 10: 357-62.
27. Kachare MV, Ingale R, Mutthe MN, Kamble MP. Antibacterial Activity and Anti-inflammatory Activity *Vitex Negundo* (Nirgudi) Plant Extract.
28. Maurya A, Pal S, Pandey KK, Mishra PK, Yadav VS, Kumar R. An Overview of Nirgundi (*Vitex negundo*): A Traditional Ayurvedic Herb for Pain Relief and Healing. *INTERNATIONAL JOURNAL OF AYURVEDIC MEDICINE*, 2025; 15(S1): 135-40.
29. Bhat PM, Umale H, Lahankar M. Amalaki: A review on functional and pharmacological properties. *Journal of Pharmacognosy and phytochemistry*, 2019; 8(3): 4378-82.

30. Paterniti I, Impellizzeri D, Cordaro M, Siracusa R, Bisignano C, Gugliandolo E, Carughi A, Esposito E, Mandalari G, Cuzzocrea S. The anti-inflammatory and antioxidant potential of pistachios (*Pistacia vera* L.) in vitro and in vivo. *Nutrients*, 2017 Aug., 22; 9(8): 915.
31. Liang J, Cui L, Li J, Guan S, Zhang K, Li J. Aloe vera: a medicinal plant used in skin wound healing. *Tissue Engineering Part B: Reviews*, 2021 Oct., 1; 27(5): 455-74.
32. Naini MA, Zargari-Samadnejad A, Mehrvarz S, Tanideh R, Ghorbani M, Dehghanian A, Hasanzarrini M, Banaee F, Koohi-Hosseinabadi O, Tanideh N, Iraj A. Anti-inflammatory, antioxidant, and healing-promoting effects of Aloe vera extract in the experimental colitis in rats. *Evidence-Based Complementary and Alternative Medicine*, 2021; 2021(1): 9945244.
33. Sharma A, Babbar A, Chary KJ. Neuro-Resilience with *Emblica officinalis* (Amla): Targeting Oxidative Stress and Neuroinflammation. In *Phototherapeutic Approaches to Neuro degeneration: Current Trends and Prospects* 2026 Jan., 2: 287-309. Singapore: Springer Nature Singapore.
34. Yokozawa T, Kim HY, Kim HJ, Okubo T, Chu DC, Juneja LR. Amla (*Emblica officinalis* Gaertn.) prevents dyslipidaemia and oxidative stress in the ageing process. *British Journal of Nutrition*, 2007 Jun., 97(6): 1187-95.
35. Srivastava AK, Singh VK. Tulsi (*Ocimum sanctum*): A potent adaptogen. *Clinical Research Notes*, 2021 Nov., 15; 2(2): 01-5.
36. Mahto K, Kuwar OK, Maloo A, Kumar A. Therapeutic potential of *Boswellia serrata* in arthritis management: mechanistic insights into COX-2, 5-LOX, and NFκB modulation. *Inflammo pharmacology*, 2025 Sep., 33(9): 5085-96.
37. Ammon HP. Boswellic acids in chronic inflammatory diseases. *Planta medica*, 2006 Aug., 72(12): 1100-16.
38. Solanki N, Gupta G, Chellappan DK, Singh SK, Gulati M, Paudel KR, Hansbro PM, Dua K, Bhan S, Saini M, Dureja H. Boswellic acids: a critical appraisal of their therapeutic and nutritional benefits in chronic inflammatory diseases. *Endocrine, Metabolic & Immune Disorders-Drug Targets (Formerly Current Drug Targets-Immune, Endocrine & Metabolic Disorders)*, 2024 Jan., 1; 24(1): 116-29.
39. Ammon HP. Boswellic acids and their role in chronic inflammatory diseases. *Anti-inflammatory Nutraceuticals and Chronic Diseases*, 2016 Sep., 25: 291-327.