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EXPLORING THE THERAPEUTIC POTENTIAL OF ERIGERON CANADENSIS IN PRIMARY DYSMENORRHEA: MOLECULAR DOCKING AGAINST COX-2 AND A PROSPECTIVE CLINICAL STUDY

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ABSTRACT

Background: Primary dysmenorrhea is a common cause of menstrual pain among women of reproductive age and is primarily associated with increased prostaglandin-mediated uterine contractions. Erigeron canadensis L. has traditionally been used in homeopathic practice for painful menstruation, but clinical evidence and information regarding its possible molecular targets remain limited. This pilot study aimed to explore the potential interaction between E. canadensis phytoconstituents and cyclooxygenase-2 (COX-2) using molecular docking and to evaluate changes in pain intensity following administration of E. canadensis mother tincture in women with primary dysmenorrhea.

Methods: The study comprised two components: an in silico molecular docking study and a prospective clinical pilot study. Phytoconstituents of E. canadensis were docked against COX-2 using the Schrödinger Glide platform, and docking scores were evaluated. The clinical component was conducted at Yenepoya Homoeopathic Medical College & Hospital from May to July 2026. Thirteen women aged 18–35 years with clinically diagnosed primary dysmenorrhea, a Visual Analogue Scale (VAS) pain score ≥4, and symptom characteristics corresponding to E. canadensis were enrolled consecutively. Participants received E. canadensis mother tincture (Q) during episodes of menstrual pain and were followed for two consecutive days. Pain intensity was assessed using the VAS at baseline, first follow-up, and second follow-up. Changes in VAS scores were analysed using the Friedman test, followed by Bonferroni-adjusted Wilcoxon signed-rank tests when appropriate. Kendall's coefficient of concordance (W) was used to estimate effect size.

Results: Seven E. canadensis phytoconstituents showed favorable predicted interactions with COX-2, with reported docking scores ranging from 120.123 to 127.746. In the clinical study, the median VAS score decreased from 8.0 (IQR 6.5–8.0) at baseline to 4.0 (IQR 2.0–6.0) at the first follow-up and 0.0 (IQR 0.0–4.5) at the second follow-up. The Friedman test demonstrated a statistically significant difference in VAS scores across the three assessment points ($\chi^2(2) = 12.19$, $P = 0.002$), with a Kendall's W of 0.469, indicating a moderate effect.

Conclusion: In this small, uncontrolled pilot study, administration of E. canadensis mother tincture was associated with a significant reduction in menstrual pain over the two-day follow-up period. Molecular docking identified favorable predicted interactions between selected E. canadensis phytoconstituents and COX-2, providing a hypothesis regarding a possible pharmacological pathway. However, docking predictions cannot establish biological activity, and the uncontrolled clinical design precludes causal inference. Larger controlled clinical studies, together with experimental validation of the predicted molecular interactions, are warranted.

KEYWORDS: Dysmenorrhea; Erigeron; Cyclooxygenase 2; Phytotherapy.

INTRODUCTION

Primary dysmenorrhea (PD), defined as painful menstruation in the absence of identifiable pelvic pathology, is among the most prevalent gynecological disorders affecting women of reproductive age.[1,2] Globally, its prevalence ranges from 50% to 90%, with the highest burden observed among adolescents and young women.[2,3] Although not life-threatening, PD represents a significant public health problem because of its recurrent nature and its profound impact on physical, psychological, academic, and occupational well-being.[2–4] Menstrual pain is frequently accompanied by systemic symptoms such as nausea, vomiting, headache, fatigue, lower back pain, diarrhea, and dizziness, all of which contribute to impaired quality of life, increased absenteeism from school and work, and reduced productivity.[2,4] Consequently, dysmenorrhea imposes a considerable socioeconomic burden and remains an important women's health concern requiring effective and accessible therapeutic strategies.[2–4]

The pathophysiology of primary dysmenorrhea is predominantly attributed to excessive synthesis of endometrial prostaglandins, particularly prostaglandin F2α (PGF2α) and prostaglandin E2 (PGE2), during the late luteal and menstrual phases.[2,5,6] Progesterone withdrawal at the onset of menstruation initiates phospholipid degradation and activation of the cyclooxygenase (COX) pathway, resulting in increased prostaglandin production.[5,6] Elevated prostaglandin concentrations induce intense uterine contractions, vasoconstriction, reduced uterine perfusion, and transient myometrial ischemia, ultimately producing the characteristic cramping pelvic pain.[2,6] Among the enzymes involved in prostaglandin biosynthesis, cyclooxygenase-2 (COX-2) plays a pivotal role, as its expression increases during menstruation and substantially contributes to inflammatory pain signalling.[5,6] Therefore, COX-2 has emerged as a key molecular target in the pharmacological management of primary dysmenorrhea.[5]

Current management of primary dysmenorrhea primarily relies on non-steroidal anti-inflammatory drugs (NSAIDs) and hormonal contraceptives.[2,4,6] NSAIDs exert their therapeutic effect by inhibiting cyclooxygenase enzymes, thereby reducing prostaglandin synthesis and alleviating uterine hypercontractility.[5,6] Hormonal therapies suppress ovulation and limit endometrial proliferation, leading to decreased prostaglandin production.[2,4] Although these interventions provide satisfactory pain relief for many women, approximately 15–20% of patients experience inadequate symptom control or NSAID resistance.[2,4] Furthermore, gastrointestinal adverse effects, cardiovascular concerns associated with prolonged COX-2 inhibition, hormonal contraindications, and patient preference for non-hormonal or complementary therapies have encouraged the exploration of alternative therapeutic options with improved safety profiles.[2,4]

Medicinal plants have increasingly attracted scientific interest as potential sources of safer anti-inflammatory and analgesic agents.[9,10] Their diverse phytochemical constituents—including flavonoids, phenolic acids, terpenoids, and essential oils—have been shown to modulate inflammatory mediators, oxidative stress, and prostaglandin synthesis.[9,10] Recent pharmacological investigations integrating phytochemistry, molecular docking, and experimental validation have strengthened the evidence supporting the use of herbal medicines as complementary approaches for managing dysmenorrhea.[9,10] These developments have encouraged researchers to evaluate traditionally used medicinal plants using modern computational and clinical methodologies to establish evidence-based therapeutic applications.[7,9]

Erigeron canadensis L. (Canadian horseweed), a member of the family Asteraceae, is a medicinal plant widely employed in traditional and homeopathic medicine.[9,12,13] In homeopathy, the mother tincture is prepared from the whole fresh flowering plant and has traditionally been prescribed for uterine disorders characterized by profuse uterine bleeding, painful menstruation, pelvic congestion, and cramping pelvic pain.[12,13] Despite its long-standing clinical use, the scientific evidence supporting its therapeutic role in primary dysmenorrhea remains limited, and its underlying molecular mechanism has not been adequately elucidated.[9,10]

Recent in silico investigations suggest that several phytoconstituents of Erigeron canadensis exhibit favourable binding affinity for cyclooxygenase-2 (COX-2), indicating a potential mechanism of action via inhibition of prostaglandin biosynthesis.[7,10] Since excessive COX-2 activity contributes directly to prostaglandin-mediated uterine hypercontractility and menstrual pain, these computational findings provide a biologically plausible explanation for the traditional clinical indications of Erigeron canadensis.[5,10] Nevertheless, molecular docking alone cannot establish therapeutic efficacy; integration of computational predictions with prospective clinical evidence is necessary to validate the translational significance of these observations.[7]

In recent years, the integration of molecular docking with clinical research has become an important strategy in evidence-based phytomedicine.[7] Molecular docking facilitates prediction of ligand–protein interactions, identifies potential pharmacological targets, and provides mechanistic insight that complements clinical observations.[7] When combined with prospective clinical evaluation, this translational approach strengthens biological plausibility and enhances the scientific credibility of traditionally used medicinal agents.[7] Such integration is particularly relevant in homeopathic research, where mechanistic evidence remains relatively limited despite extensive clinical use of several plant-derived medicines.[7,12,13]

Assessment of pain severity using validated outcome measures is essential for determining therapeutic effectiveness in dysmenorrhea research.[8] The Visual Analogue Scale (VAS) is a reliable, sensitive, and internationally accepted instrument for quantifying subjective pain intensity and detecting clinically meaningful changes following treatment.[8] Therefore, VAS provides an appropriate primary outcome measure for evaluating symptom improvement in women with primary dysmenorrhea.[8]

Relevance of the Study

Primary dysmenorrhea continues to affect millions of women worldwide despite the availability of effective conventional therapies.[1-6] The limitations of existing pharmacological treatments, including adverse effects, contraindications, incomplete symptom relief, and patient preference for complementary medicine, highlight the need for evidence-based alternative therapeutic approaches.[2,4-6] Although Erigeron canadensis has been extensively used in homeopathic practice for painful menstruation, there remains a paucity of prospective clinical studies evaluating its effectiveness using standardized pain assessment tools,[8] and even fewer investigations have directly correlated clinical outcomes with molecular mechanisms.[7,9,10] This gap underscores the novelty of the present study.

The present study is therefore of considerable scientific and clinical relevance because it integrates **molecular docking analysis against COX-2** with a **prospective clinical evaluation** of Erigeron canadensis in women with

primary dysmenorrhea.[5,7,9,10] The aim of this study is to correlate computational predictions with clinical outcomes measured using the Visual Analogue Scale,[8] thereby bridging the gap between traditional homeopathic knowledge and contemporary molecular pharmacology.[7] The findings are expected to provide mechanistic support for the therapeutic application of Erigeron canadensis,[9,10] strengthen the evidence base for homeopathic management of primary dysmenorrhea, promote the integration of computational biology into homeopathic research,[7] and serve as a foundation for future experimental studies, randomized controlled trials, and evidence-based clinical practice.

METHODOLOGY

The present study comprised two complementary components: (i) an in silico molecular docking study to evaluate the binding interactions of phytoconstituents of Erigeron canadensis with cyclooxygenase-2 (COX-2), a key therapeutic target implicated in the pathophysiology of primary dysmenorrhea, and (ii) a prospective clinical study to assess the clinical effectiveness of Erigeron canadensis mother tincture in patients with primary dysmenorrhea.

I: Molecular Docking Study

The 3D structure of cyclooxygenase (COX-2) is retrieved from the Protein Data Bank, and protein preparation is conducted using grid-based ligand docking with energetics. The binding pocket and functional residues are identified and characterized using the SiteMap module from the Schrödinger package. Ligands are prepared using LigPrep 2.4. Docking analysis employs standard precision mode in Glide 5.6, where phytochemicals from Erigeron canadensis are docked into the COX-2 binding site.[7]

The research uses molecular docking to investigate how phytochemicals from Erigeron canadensis interact with COX-2.[5,7] The aim is to identify potential therapeutic agents for the treatment of dysmenorrhea based on their molecular interactions with COX-2.[5,6,7] The study involves analysing docking scores, binding affinities, and molecular interactions of phytochemicals of Erigeron canadensis.[7]

This study aims to provide a scientific basis for the use of Erigeron canadensis in homeopathy by exploring interactions between its phytoconstituents and the COX-2 protein, thereby improving healthcare by identifying effective phytochemicals in homeopathic medicines.[5,7]

II: Clinical Study

This was a prospective clinical study conducted in the outpatient department of Yenepoya Homoeopathic Medical College & Hospital from May 2026 to July 2026. As this was a pilot study, a formal sample size calculation was not performed. A convenience sample of 13 patients who met the eligibility criteria and provided written informed consent was enrolled consecutively during the study period. The inclusion and exclusion criteria used for participant selection are presented in Table 1.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
• Female participants aged **18–35 years**.	• Diagnosis of **secondary dysmenorrhea**.
• Clinically diagnosed with **primary dysmenorrhea**, characterized by recurrent cramping lower abdominal pain during menstruation in the absence of identifiable pelvic pathology.	• Presence of pelvic pathology such as **uterine fibroids, endometriosis, or pelvic inflammatory disease**.
• Moderate to severe menstrual pain with a **Visual Analogue Scale (VAS) score ≥4** during the current menstrual cycle.	• Pregnancy or lactation.
• Clinical presentation consistent with the characteristic symptom profile of Erigeron canadensis, including **one or more** of the following: – Bright red menstrual bleeding – Predominantly left-sided pelvic or lower abdominal pain associated with menstruation – Altered menstrual pattern, including irregular menstrual cycles – Pain aggravated by movement	• Current use of hormonal contraceptives, hormone replacement therapy, or other hormonal medications that may influence menstrual pain.
	• Regular use of **non-steroidal anti-inflammatory drugs (NSAIDs)**, analgesics, or other medications for chronic pain.
	• History of major systemic illness (e.g., renal, hepatic, cardiovascular, neurological, or autoimmune disorders) that could interfere with study outcomes.

Inclusion Criteria	Exclusion Criteria
	• Clinical presentation not corresponding to the predefined characteristic symptom profile of Erigeron canadensis used for remedy selection.

Intervention

Eligible participants received Erigeron canadensis mother tincture (Q).[11,12] Ten drops of the mother tincture were diluted in 30 mL of potable water, and 10 drops of the prepared solution were administered orally at hourly intervals during episodes of menstrual pain until symptomatic relief was achieved or until the pain subsided.[13] Participants were instructed to avoid other analgesics during the study period.[13] Participants were followed up for two consecutive days after initiation of treatment, during which the clinical response, pain intensity, and associated symptoms were assessed and documented at each follow-up visit.

Outcome Assessment

The primary outcome was the change in pain intensity, measured using the Visual Analogue Scale (VAS). Baseline VAS scores were recorded prior to the administration of Erigeron canadensis mother tincture, and follow-up VAS assessments were performed over the subsequent two days after treatment initiation. The difference between the baseline and follow-up VAS scores was used to assess changes in pain intensity. In addition, any changes in associated symptoms reported by the participants during the follow-up period were documented.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26.0. The normality of the VAS scores was assessed using the Shapiro–Wilk test. As the data were not normally distributed, VAS scores were summarized as median and interquartile range (IQR). Differences in VAS scores across the three assessment time points (baseline, first follow-up, and second follow-up) were analysed using the Friedman test. When the overall Friedman test was statistically significant, post hoc pairwise comparisons were performed using the Wilcoxon signed-rank test with Bonferroni correction for multiple comparisons. The effect size for the Friedman test was calculated using Kendall's coefficient of concordance (Kendall's W). All statistical tests were two-tailed, with a significance level set at $P < 0.05$. For post hoc pairwise comparisons, a Bonferroni-adjusted significance threshold of $P < 0.0167$ was applied.

RESULT

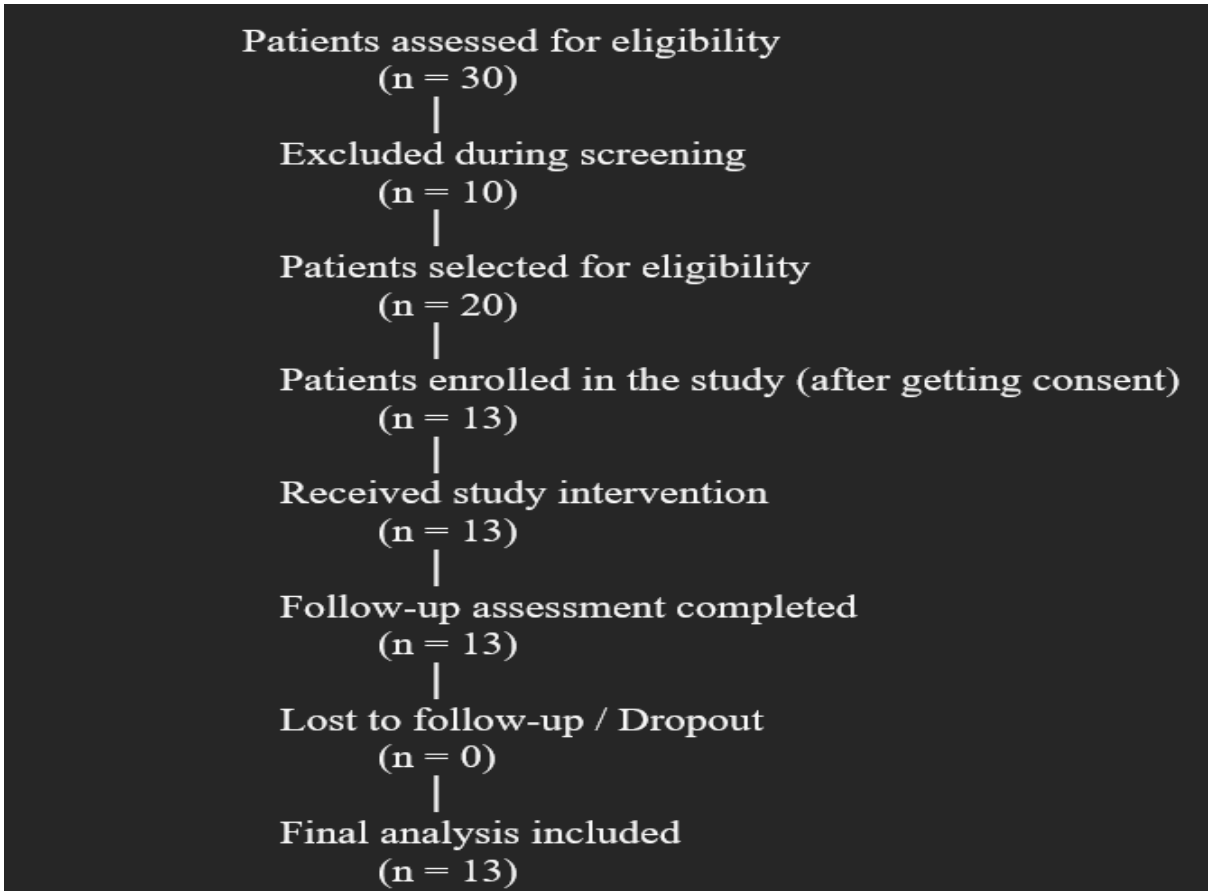

Fig.1 Flow Chart

The study included participants with a mean age of 23.7 years. Baseline clinical assessment revealed that the predominant presenting features were bright red menstrual bleeding, left-sided lower abdominal pain associated with menstruation, altered menstrual patterns, and pain aggravated by movement. The primary symptom indications guiding the prescription of Erigeron canadensis were bright red menstrual bleeding and left-sided lower abdominal pain, which were the most frequently observed characteristic features among the participants. Figure 1 shows the flow of participant recruitment, screening, eligibility assessment, enrollment, follow-up, and final analysis.

Table 2 summarizes the molecular docking results of bioactive compounds identified from Erigeron canadensis against the COX-2 protein, highlighting their binding energies and interactions with the target receptor.

SL NO	PDB ID	DOCKING SCORE	PLANT
1.	IMPHY011844	127.746	Erigeron canadensis
2.	IMPHY005543	125.301	Erigeron canadensis
3.	IMPHY013486	124.435	Erigeron canadensis
4.	IMPHY004619	124.183	Erigeron canadensis
5.	IMPHY001739	122.674	Erigeron canadensis
6.	IMPHY004660	122.436	Erigeron canadensis
7.	IMPHY008406	120.123	Erigeron canadensis

The normality of the VAS scores at baseline, first follow-up, and second follow-up was assessed using the **Shapiro–Wilk test**. The distribution of VAS scores did not meet the assumption of normality; therefore, nonparametric statistical methods were used in subsequent analyses. A Friedman test was conducted to compare Visual Analog Scale (VAS) pain scores across the three assessment time points (baseline, first follow-up, and second follow-up). The analysis demonstrated a statistically significant difference in VAS scores over time ($\chi^2(2) = 12.19$, **P = 0.002**). The corresponding effect size, measured using **Kendall's coefficient of concordance (W = 0.469)**, indicated a moderate-to-large effect of the intervention on pain reduction. Median (interquartile range [IQR]) VAS scores decreased from **8.0 (6.5–8.0)** at baseline to **4.0 (2.0–6.0)** at the first follow-up and **0.0 (0.0–4.5)** at the second follow-up. These findings demonstrate a statistically significant reduction in pain intensity across the study period (Table 3).

Table 3. Comparison of VAS Scores Across Three Time Points Using the Friedman Test (n = 13)

Outcome	Baseline Median (IQR)	First Follow-up Median (IQR)	Second Follow-up Median (IQR)	Friedman χ^2 (df)	P value	Effect Size (Kendall's W)
VAS Score	8.0 (6.5–8.0)	4.0 (2.0–6.0)	0.0 (0.0–4.5)	12.19 (2)	**0.002**	**0.469**

DISCUSSION

The present study is undertaken to evaluate the effectiveness of Erigeron canadensis mother tincture in the management of primary dysmenorrhea by combining molecular docking analysis with prospective clinical evaluation.[7,11,12] The study is designed with the intention of not only assessing the clinical response following administration of the medicine but also exploring a possible molecular basis for its action.[7] By integrating computational analysis with clinical findings, the study attempts to provide supportive scientific evidence for the traditional use of Erigeron canadensis in painful menstrual disorders.[9,10,11,12]

Primary dysmenorrhea is one of the most common gynaecological complaints affecting young women and is mainly associated with increased synthesis of prostaglandins during menstruation.[1,2,3] Excessive prostaglandin production results in strong uterine contractions, reduced uterine blood flow and transient ischemia, leading to the characteristic cramping pain experienced during menstruation.[2,5,6] Among the enzymes involved in prostaglandin synthesis, cyclooxygenase-2 (COX-2) protein plays an important role and has therefore become an established therapeutic target in the management of primary dysmenorrhea.[5,6] Most conventional drugs used for dysmenorrhea act by inhibiting the COX pathway, thereby reducing prostaglandin production and relieving pain.[4,5,6] Based on this mechanism, COX-2 is selected as the target protein for the molecular docking study.[5,7]

The molecular docking study is carried out to predict the interaction between the phytoconstituents of Erigeron canadensis and the COX-2 protein.[7,9,10] Although it is a computational method, it provides valuable information regarding the possible mechanism of action of a drug.[7]

In the present study, the phytoconstituents of Erigeron canadensis demonstrate favourable interaction with the COX-2 protein. Several compounds show good docking scores, indicating a strong affinity towards the selected target. These findings suggest that the phytoconstituents present in Erigeron canadensis may interact with the active site of the COX-2 enzyme and may influence prostaglandin synthesis.[5,7,9,10] Since prostaglandins play a major role in the pathogenesis of primary dysmenorrhea, inhibition of this pathway may contribute to the reduction of menstrual pain.[2,5,6]

The docking findings support the possibility that Erigeron canadensis possesses anti-inflammatory activity through modulation of the COX-2 pathway.[9,10] However, molecular docking alone cannot confirm the therapeutic action of a medicine in humans.[7] Docking analysis only predicts the likelihood of interaction between a ligand and a target protein under computational conditions. It does not establish pharmacological activity, bioavailability or clinical effectiveness.[7] Therefore, the findings obtained from the molecular docking study require validation through clinical evaluation.

For this reason, the second part of the present study focuses on assessing the clinical effectiveness of Erigeron canadensis mother tincture in patients with primary dysmenorrhea. A prospective clinical study is conducted among women fulfilling the inclusion criteria. The medicine is prescribed only to those patients whose symptom picture matches the characteristic indications of Erigeron canadensis.[11,12] Clinical improvement is assessed using the Visual Analogue Scale (VAS), an accepted tool for measuring pain intensity.[8] The combination of molecular docking analysis with prospective clinical assessment enables the present study to evaluate both the possible mechanism of action and the therapeutic response of Erigeron canadensis in primary dysmenorrhea.[7,8]

The prospective clinical study includes 13 patients diagnosed with primary dysmenorrhea who fulfil the inclusion criteria. The mean age of the participants is 23.7 years, showing that the majority belong to the young reproductive age group. This finding is similar to previous studies which state that primary dysmenorrhea is more common in adolescents and young women.[1,2,3] This may be because regular ovulatory menstrual cycles are established during this period, resulting in increased prostaglandin production and painful uterine contractions.[2,6]

Erigeron canadensis is selected for clinical evaluation because of its traditional use in homoeopathy for uterine disorders, particularly painful menstruation associated with bright red bleeding and pelvic congestion.[11,12] To ensure appropriate remedy selection, only those patients who fulfil the characteristic symptom profile of Erigeron canadensis, including bright red menstrual bleeding, left-sided lower abdominal pain, altered menstrual pattern, and pain aggravated by movement, are included in the study.[11,12] Among these features, bright red menstrual bleeding and left-sided lower abdominal pain are the most frequently observed clinical findings. The similarity between the patient's symptom picture and the drug picture supports the choice of the medicine in the present study.[11,12]

The medicine is administered in mother tincture form according to the study protocol.[13] Each participant receives Erigeron canadensis mother tincture after fulfilling the inclusion criteria and after obtaining informed consent.[13] The response to treatment is assessed using the Visual Analogue Scale (VAS).[8] Recording pain scores before and after treatment makes it possible to assess the change in pain objectively during the follow-up period.[8]

At baseline, the median VAS score is 8.0, indicating that most participants experience moderate to severe menstrual pain. During the first follow-up, the median score decreases to 4.0, and by the second follow-up it further decreases to 0.0. This progressive reduction in pain scores demonstrates a marked improvement following administration of Erigeron canadensis mother tincture. In addition to pain relief, several participants also report improvement in associated menstrual discomfort, enabling them to perform their routine daily activities with greater ease during menstruation.

The statistical analysis further supports these clinical observations. Since the VAS scores do not follow a normal distribution, non-parametric statistical tests are used. The Friedman test demonstrates a statistically significant difference in pain scores across the three assessment periods ($\chi^2 = 12.19$, $P = 0.002$). This indicates that the reduction in pain observed during the study period is statistically significant. The effect size calculated using Kendall's coefficient of concordance ($W = 0.469$) indicates a moderate to large treatment effect, suggesting that the observed improvement is not only statistically significant but also clinically meaningful.

In the present study, the improvement observed among patients presenting with these characteristic symptoms further supports its clinical usefulness when prescribed on the basis of individualisation.[11,12] Although the sample size is limited, the consistent reduction in pain scores among the participants suggests that Erigeron canadensis may be beneficial in relieving the symptoms of primary dysmenorrhea in appropriately selected cases.

The findings of the clinical study also complement the molecular docking results. While the docking study suggests that the phytoconstituents of Erigeron canadensis are capable of interacting with the COX-2 enzyme,[7,9,10] the clinical study demonstrates a significant reduction in menstrual pain following treatment. The findings from both the molecular docking and clinical study support each other and provide preliminary evidence for the possible therapeutic role of Erigeron canadensis in the management of primary dysmenorrhea. However, further experimental studies are required to explain the exact mechanism responsible for the observed clinical improvement.

The findings of the present study support the growing interest in integrating computational methods with clinical research in homoeopathy. Molecular docking helps to predict the interaction between phytoconstituents and target proteins,[7] whereas the clinical study evaluates the actual therapeutic response in patients. By combining these two approaches, the present study provides both scientific and clinical evidence for the use of Erigeron canadensis in primary dysmenorrhea. Although the molecular docking findings alone cannot establish clinical efficacy,[7] the reduction in pain observed during the clinical study supports the possibility that the predicted interaction with the COX-2 enzyme may contribute to the therapeutic effect of the medicine.

The findings of the present study are consistent with the current understanding of the pathophysiology of primary dysmenorrhea. Increased prostaglandin production through the cyclooxygenase pathway is considered the main cause of painful uterine contractions during menstruation.[2,5,6] The favourable interaction observed between the phytoconstituents of Erigeron canadensis and the COX-2 enzyme in the molecular docking study provides a possible explanation for the reduction in pain observed during the clinical evaluation.[5,7,9,10] However, this proposed mechanism requires confirmation through laboratory and pharmacological studies.

Erigeron canadensis is prescribed only in those participants whose symptoms correspond to the indications described in homoeopathic literature, particularly bright red menstrual bleeding and left-sided pelvic pain.[11,12] The favourable clinical response observed in these patients further supports the importance of individualization in homoeopathic prescribing.[13]

One of the strengths of the present study is that it combines molecular docking with prospective clinical evaluation. This approach helps to bridge the gap between traditional homoeopathic knowledge and modern scientific research. The use of the Visual Analogue Scale provides a standardized method for assessing pain intensity,[8] and the same assessment is followed for all participants throughout the study period. The study also evaluates patients prospectively, allowing changes in pain intensity to be documented systematically after administration of the medicine.

Although favourable results are observed in the present study, it has certain limitations. The study is conducted with a small sample size of 13 participants and is limited to a single institution. As this is a pilot study, the findings cannot be generalized to the wider population. The follow-up period is short, and the absence of a control group or placebo group limits direct comparison of treatment outcomes. In addition, molecular docking provides only computational predictions of ligand–protein interactions and does not confirm biological activity under clinical conditions.[7] Therefore, further experimental studies are required to validate the proposed mechanism of action.

Based on the observations of the present study, further research is recommended with a larger sample size and a multicentric study design to improve the generalizability of the findings. Randomized controlled trials with longer follow-up periods may provide stronger clinical evidence regarding the effectiveness of Erigeron canadensis in primary dysmenorrhea. Further in vitro and in vivo studies are also required to validate the molecular docking findings and to identify the active phytoconstituents responsible for the observed therapeutic effects.[7,9,10] Future research may also explore additional molecular targets involved in the pathogenesis of primary dysmenorrhea to better understand the pharmacological action of Erigeron canadensis.[5,9,10]

The present study demonstrates that Erigeron canadensis mother tincture is associated with a significant reduction in pain intensity in women with primary dysmenorrhea. The molecular docking study demonstrates favourable interaction of the phytoconstituents with the COX-2 enzyme, while the clinical study shows a progressive reduction in VAS scores following treatment. The findings from both components complement each other and provide preliminary evidence supporting the possible therapeutic role of Erigeron canadensis in the management of primary dysmenorrhea. Although further studies are required to confirm these observations, the present study contributes to the existing evidence and provides a scientific basis for future research on the clinical application of Erigeron canadensis in homeopathic practice.

CONCLUSION

The present study demonstrates the potential role of Erigeron canadensis mother tincture in managing primary dysmenorrhea through a combination of molecular docking analysis and prospective clinical evaluation. The molecular docking study shows favorable interaction of the phytoconstituents of Erigeron canadensis with the COX-2 enzyme, suggesting a possible mechanism for reducing prostaglandin-mediated menstrual pain. The clinical study also demonstrates a statistically significant reduction in Visual Analogue Scale (VAS) scores following treatment, indicating improvement in pain intensity among the participants.

The findings of both the molecular docking and clinical studies complement each other and provide preliminary evidence for the potential therapeutic role of Erigeron canadensis in appropriately selected cases of primary dysmenorrhea. The use of molecular docking together with prospective clinical assessment adds scientific support to the traditional homoeopathic use of the medicine and contributes to the existing evidence in this field.

However, the findings should be interpreted with caution because the study is a pilot study with a small sample size, short follow-up period, and no control group. Therefore, larger multicentric randomized controlled trials with longer follow-up, along with in vitro and in vivo studies, are required to confirm these findings and further validate the proposed mechanism of action.

Within these limitations, the present study provides encouraging preliminary evidence and serves as a basis for future research on the role of Erigeron canadensis in managing primary dysmenorrhea.

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Annexure - 1

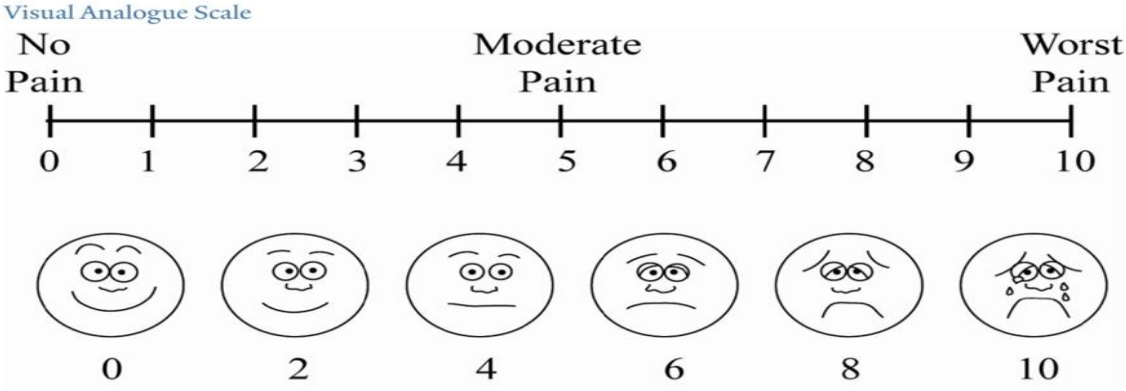
PRELIMINARY DATA

Name of the patient: ……
Age: ……. Religion: ……. Nationality: …….
Name of father/spouse: ……
Marital status: ……..
Occupation: ……..
Address: ……
Phone: ……
LMP: ……..

CLINICAL SYMPTOMS OF ERIGERON

☐ Bright red bleeding
< Movement
☐ Left sided pain
Irregular menses
☐
ASSOCIATED SYMPTOMS
☐

VAS SCORE



PRESCRIPTION
FOLLOW UP 1
SYMPTOMS:
VAS SCORE:
FOLLOW UP 2
SYMPTOMS:
VAS SCORE:

Annexure – 2
CONSENT FORM
Title of Study:
Clinical Study to Evaluate the Effectiveness of Erigeron canadensis in the Management of Primary Dysmenorrhea
Investigator Name: _____
Institution/College: _____
Purpose of Study:
I am informed that this study is conducted to evaluate the effectiveness of Erigeron canadensis in the management of primary dysmenorrhea (painful menstruation).
Procedure:
I understand that I am given the study medicine and my symptoms are assessed periodically. I may be asked questions regarding my menstrual pain and associated symptoms.
Voluntary Participation:
I understand that my participation is voluntary. I am free to withdraw from the study at any time without giving any reason and without affecting my treatment.
Confidentiality:
My personal details are kept confidential and are used only for research purposes.
Risk and Benefits:
I understand that there are no known serious risks associated with this treatment. I may benefit from improvement in my symptoms and treatment for others in the future, but no guarantee is given.
Consent:
I read and understand the above information. I voluntarily agree to participate in this study.
Participant Name :-
Participant Signature :-
Date: