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Herbal Analgesics in Pediatric Surgery: From Traditional Evidence to Scientific Validation

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A B S T R A C T

Objective: The use of medicinal herbs, plant oils, and essential oils for postoperative pain relief has a longstanding history in traditional medicine, particularly in pediatric care, where ancient physicians frequently employed such remedies. Despite their widespread application, comprehensive and systematic scientific evaluations of their efficacy in children remain limited. Preliminary evidence from traditional texts alongside select modern studies suggests a potential role for these natural treatments in managing postoperative pain. This study aims to review classical Iranian traditional medicine sources and assess the current scientific evidence regarding herbal remedies effective in reducing surgical pain in children.

Methodology: This review employed a qualitative approach, gathering information from authoritative traditional medical texts such as Avicenna's *Canon of Medicine*, *Zakhireh Kharazmshahi*, *Tuhfeh Hakim Mo'men*, and *Makhzan al-Advieh.* Concurrently, scientific articles were systematically searched and analyzed using keywords including "pain," "surgery," "children," and "medicinal plants" across indexed academic databases.

Results: Analysis revealed a diverse range of medicinal plants traditionally utilized in Iranian medicine for alleviating postoperative pain in children. Notable herbs include *Borago officinalis L., Curcuma longa L., Zingiber officinale Roscoe, Matricaria chamomilla L., Lavandula angustifolia Mill., Mentha piperita L., Rosmarinus officinalis L., Eucalyptus globulus Labill., Petroselinum crispum (Mill.) Fuss, Nigella sativa L., Syzygium aromaticum (L.) Merr. & L.M.Perry, Salvia officinalis L., Rosa spp. L., Althaea officinalis L., Ricinus communis L., Olea europaea L., Aloe vera (L.) Burm.f.* These herbs were primarily administered as gels, oils, essential oils, or through aromatherapy.

Conclusion: The findings suggest that certain herbs, particularly chamomile, lavender, marshmallow, aloe vera, and peppermint, demonstrate a favorable safety profile in pediatric populations and have garnered more attention for their analgesic effects after surgery. However, despite substantial traditional documentation and preliminary scientific support, a significant lack of rigorous clinical trials impedes their full scientific acceptance. Further experimental and clinical research is imperative to establish the efficacy and safety of these herbal interventions in pediatric surgical pain management.

Keywords: Surgery, pain, children, aromatherapy, essential oils, herbal oils, Iranian traditional medicine

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Introduction

Children who underwent any surgery may suffer from incontinence, constipation, soiling, pain, and inappropriate feeding in short-term and long-term periods after their surgery [1]. Pain is one of the most common symptoms following surgery in children and can significantly affect their quality of life [2]. Effective management of postoperative pain, particularly in pediatric patients, remains a major challenge in clinical practice [3]. This issue is especially important because postoperative pain can adversely impact the growth and recovery process in children [4]. Chronic pain may lead to psychological and physical complications such as anxiety and depression, which in turn can delay the healing process [5].

Duration of preoperative symptoms of the disease could actually impact the postoperative ability of the infant to tolerate full feeding and thus prolong the hospitalization [4]. The etiology of postoperative pain in children is typically related to stimulation of injured tissues, inflammation, and abnormal activity within the nervous system [5]. Epidemiological data indicate that this problem is frequently observed across many pediatric surgical procedures [6]. The intensity of postoperative pain depends on various factors including the type of surgery, the child's age, and their overall health status [7]. The pathophysiology mainly involves tissue inflammation and activation of nociceptors at the surgical site. Conventional pharmacological agents often alleviate pain by blocking these receptors or reducing inflammation [8]. Although chemical analgesics are widely used, some of these drugs may cause serious side effects. Therefore, the use of herbal analgesics as complementary or alternative treatments has gained increasing attention [9].

Due to concerns about the adverse effects of chemical drugs, medicinal plants have been investigated as safer and effective options in many cases [10]. These herbs have been extensively used in traditional medicine, and emerging scientific evidence supports their efficacy in reducing pain and inflammation [11]. Unlike chemical drugs, medicinal plants often provide anti-inflammatory and calming properties, which can effectively reduce pain while offering a natural, safe therapy with minimal side effects [12]. This review aims to examine both traditional and scientific evidence regarding the use of herbal analgesics in pediatric surgery and to evaluate their impact on pain relief and postoperative recovery.

Methodology

This traditional review study gathered data from authoritative sources of Iranian traditional medicine including The Canon of Medicine by Avicenna, Zakhireh Kharazmshahi, Tuhfeh Hakim Mo'men, and Makhzan al-Advieh. Additionally, scientific articles related to the study topic were systematically searched and analyzed through indexed academic databases using keywords such as "pain," "surgery," "children," and "medicinal plants."

Inclusion Criteria

Classical texts of Iranian traditional medicine

Scientific articles published in reputable scientific and medical databases

Studies focused on postoperative pain management in children

Articles addressing the use of medicinal plants for pain relief after surgery

Credible traditional medicine sources that specifically discuss herbal treatments for postoperative pain

Publications in both Persian and English languages

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Exclusion Criteria

Articles focused on chemical drugs or non-herbal therapies for pain relief

Unreliable sources lacking valid scientific documentation

Studies unrelated to the research topic

Sources providing incomplete or summary-level information

This search and selection methodology enabled precise identification of relevant studies aligned with the research objectives and facilitated a comprehensive analysis of the available data.

Results

The findings from the reviewed sources revealed that a diverse range of medicinal plants has been traditionally used in Iranian medicine for managing postoperative pain in children. Notable among these are *Borago officinalis L., Curcuma longa L., Zingiber officinale Roscoe, Matricaria chamomilla L., Lavandula angustifolia Mill., Mentha piperita L., Rosmarinus officinalis L., Eucalyptus globulus Labill., Petroselinum crispum (Mill.) Fuss, Nigella sativa L., Syzygium aromaticum (L.) Merr. & L.M.Perry, Salvia officinalis L., Rosa spp. L., Althaea officinalis L., Ricinus communis L., Olea europaea L., Aloe vera (L.) Burm.f.*.

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Table 1. *Phytotherapeutic Agents: Medicinal Plants and Their Analgesic Mechanisms*

Persian name	**Common English name**	***Scientific name***	**Herbal family**	**Mechanism of Action [13-25]**
Gavzaban	Borage	*Borago officinalis* L.	Boraginaceae	Anti-inflammatory and analgesic effects; reduces nerve irritation and relieves muscular and joint pain.
Zardchoubeh	Turmeric	*Curcuma longa* L.	Zingiberaceae	Contains curcumin with anti-inflammatory and analgesic properties; reduces inflammation and relieves pain.
Zangabil	Ginger	*Zingiber officinale* Roscoe	Zingiberaceae	Anti-inflammatory and analgesic by inhibiting inflammatory enzymes and reducing prostaglandin production.
Babouneh	Chamomile	*Matricaria chamomilla* L.	Asteraceae	Sedative and anti-inflammatory effects; relieves muscular and gastrointestinal pain; calms the central nervous system.
Ostokhodous	Lavender	*Lavandula angustifolia* Mill.	Lamiaceae	Sedative and analgesic effects; relieves nerve and muscle pain through stimulation of GABA receptors in the brain.
Naena felfeli	Peppermint	*Mentha piperita* L.	Lamiaceae	Analgesic and sedative effects; reduces muscle tension and alleviates gastrointestinal pain.
Rozmari	Rosemary	*Rosmarinus officinalis* L.	Lamiaceae	Anti-inflammatory and analgesic effects; increases blood flow and relieves muscular and joint pain.
Okaliptus	Eucalyptus	*Eucalyptus globulus* Labill.	Myrtaceae	Analgesic and anti-inflammatory effects through COX-2 enzyme inhibition and inflammation reduction.

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Jafari	Parsley	*Petroselinum crispum* (Mill.) Fuss	Apiaceae	Anti-inflammatory effect; reduces muscular pain, improves circulation, and decreases swelling.
Siahdaneh	Black Cumin	*Nigella sativa* L.	Ranunculaceae	Anti-inflammatory, analgesic, and immune system boosting effects.
Mikhak	Clove	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Myrtaceae	Analgesic and anti-inflammatory effects; relieves dental and joint pain through inhibition of inflammatory enzymes.
Maryamgoli	Sage	*Salvia officinalis* L.	Lamiaceae	Anti-inflammatory and analgesic effects; reduces inflammation and relieves gastrointestinal and muscular pain.
Golesorkh	Rose	*Rosa spp.* L.	Rosaceae	Anti-inflammatory and sedative effects; reduces joint and muscular pain.
Khatmi	Marshmallow	*Althaea officinalis* L.	Malvaceae	Anti-inflammatory and analgesic effects; relieves gastrointestinal pain and accelerates wound healing.
Karchak	Castor	*Ricinus communis* L.	Euphorbiaceae	Anti-inflammatory and analgesic effects; relieves muscular and joint pain.
Zeytoun	Olive	*Olea europaea* L.	Oleaceae	Anti-inflammatory and analgesic effects; reduces inflammation and improves blood circulation.
Aloevera	Aloe Vera	*Aloe vera* (L.) Burm.f.	Asphodelaceae	Analgesic and anti-inflammatory effects; relieves skin pain and reduces inflammation and irritation in affected areas.

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Discussion

The findings of this review indicate that the use of medicinal plants as analgesic treatments in pediatric surgery has deep roots in traditional Iranian medicine and aligns well with emerging scientific evidence. Plants such as chamomile, lavender, marshmallow, aloe vera, and peppermint have gained particular attention due to their relatively high safety profiles and desirable efficacy. This is especially important because children, owing to their increased sensitivity and higher risk of adverse drug reactions, require treatments with confirmed safety [26–28].

Plants like borage, turmeric, and ginger, containing anti-inflammatory and analgesic compounds such as curcumin and gingerol, can alleviate postoperative pain by inhibiting inflammatory pathways and reducing prostaglandin production [29–31]. These mechanisms are similar to those of nonsteroidal anti-inflammatory drugs (NSAIDs), yet medicinal plants generally exhibit fewer side effects, an advantage that is particularly valuable in pediatric pain management [29–31].

The use of essential oils and aromatherapy in traditional medicine has also been employed to reduce pain and anxiety following surgery, especially in children. Lavender and peppermint exert calming effects on the central nervous system, reducing muscle tension and anxiety, which in turn helps alleviate pain. These findings are consistent with modern studies demonstrating the neurophysiological effects of essential oils [31, 33]. However, the greatest challenge in scientifically accepting these treatments is the lack of rigorous and systematic clinical trials in children. Most available evidence is derived either from animal and laboratory studies or from experiential and observational reports in traditional medicine. Therefore, conducting well-designed clinical trials with adequate sample sizes and scientific standards is essential to confirm the safety and efficacy of these plants in managing postoperative pain in children. Furthermore, combining herbal treatments with modern pain control methods could improve therapeutic outcomes and reduce the use of chemical drugs that often have multiple side effects, especially in pediatric patients. Educating parents and healthcare teams about the proper and safe use of these natural therapies can also enhance postoperative care. In many diseases and disorders [34-38], turning to nature and embracing traditional or natural therapeutic approaches can serve as a beneficial and complementary strategy helping to alleviate symptoms, support overall well-being, and enhance patients' quality of life [39].

Conclusion

In conclusion, this review highlights that traditional Iranian medicine is a rich and reliable source for identifying analgesic medicinal plants, which, supported by scientific research, can serve as safe complementary treatments for managing postoperative pain in children. Paying attention to these resources can open new pathways toward low-risk, natural, and effective therapies in pediatric medicine

Statements and Declarations

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Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

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