IJIRHS.ORG | ISSN: 3107-4219
INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN HEALTH SCIENCE
An International Open Access, Peer-reviewed, Refereed Journal

A STUDY TO EVALUATE THE EFFECTIVENESS OF AROMATHERAPY WITH DRY INHALATION OF LAVENDER ESSENTIAL OIL ON PAIN AMONG POST-OPERATIVE PATIENTS IN ORTHOPAEDIC WARD AT GOVERNMENT RAJAJI HOSPITAL, MADURAI.

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Abstract:

Background: Postoperative pain is a key clinical issue for individuals undergoing open reduction and internal fixation (ORIF) in orthopaedic practice. Poorly controlled pain can slow recovery, extend the duration of hospitalization, increase the likelihood of complications, and adversely affect both physical and psychological health. **Aim:** This study sought to determine the effectiveness of lavender essential oil aromatherapy, delivered via dry inhalation, in reducing postoperative pain among orthopaedic patients. **Methodology:** A quantitative evaluative design using a true experimental pre-test–post-test control group approach was adopted. Sixty postoperative ORIF patients were selected through simple random sampling and randomly allocated to an intervention group (n = 30) or a control group (n = 30). Pain intensity was evaluated using the Numerical Pain Rating Scale. The intervention group received dry inhalation of lavender essential oil for five minutes, twice daily, from the second to the fourth postoperative day, whereas the control group continued to receive only routine postoperative care. Pain scores were recorded immediately before and after each intervention period. **Results**: At baseline, there was no statistically significant difference in pain scores between the two groups ($p > 0.05$). By the second postoperative day, the intervention group showed a significant reduction in pain intensity ($p = 0.001$), with additional significant decreases noted on the third postoperative day. **Conclusion:** Dry inhalation of lavender essential oil appears to be an effective, safe, non-invasive, and low-cost complementary strategy for alleviating postoperative pain in patients following ORIF procedures.

Keywords: Postoperative pain, orthopedic patients, Pain

INTRODUCTION

The concept of health has transformed over time. From a biomedical perspective, health was traditionally viewed as the body's ability to function normally and as the absence of disease. In this model, illness represented a disruption in the natural functioning of the body. Health is now more broadly defined as a state of anatomic, physiological, and psychological integrity, enabling individuals to fulfill personal, familial, and social roles while adapting to physical, biological, psychological, and social stressors.

The World Health Organization (WHO) played a key role in advancing health promotion and encouraging global awareness of preventive health measures. Programs such as Healthy People 2020 further emphasized the significance of prevention and the social determinants of health while promoting a more accessible, digital platform for dissemination. Health maintenance and improvement depend not only on healthcare services but also on multiple determinants of health—including genetic background, lifestyle, socioeconomic conditions, environment, and spirituality. The term "healthy" is also applied to communities and environments that support human well-being.

Pain may result from injury, illness, or surgical procedures, and it commonly accompanies orthopedic conditions or surgeries. It is often categorized as acute (short-term) or chronic (persistent). The pathophysiology of pain involves nociceptors that transmit signals through the spinal cord to the brain, where pain is perceived, processed, and modulated within the "pain matrix" — including the thalamus, hypothalamus, insular cortex, and periaqueductal gray matter. Both ascending and descending neural pathways influence the perception and suppression of pain through neurotransmitters such as serotonin and opioid peptides.

In orthopedic patients, pain often originates from tissue damage, inflammation, or surgical incisions. Unrelieved postoperative pain can lead to complications such as infection risk, delayed healing, negative mood changes, and prolonged hospital stays. Effective management, therefore, focuses on both pharmacological and non-pharmacological approaches to reduce discomfort and promote recovery.

Complementary therapies, particularly aromatherapy, have shown beneficial effects in reducing pain and anxiety, improving mood, and enhancing comfort. Aromatherapy involves the use of essential oils through inhalation or diffusion to influence physical and emotional well-being.

METHODOLOGY:

Study Design and Setting

The study employs a quantitative evaluative research approach using a true experimental pre-test and post-test control group design. Participants are randomly assigned to either the intervention or control group. Pain levels are measured prior to the intervention and at multiple intervals afterward. The research is carried out at

Government Hospital, Madurai—a tertiary care, multi-specialty teaching institution affiliated with Madurai Medical College.

Participants and Sampling

The target population comprises postoperative orthopaedic patients, while the accessible population includes patients admitted to the orthopaedic ward. The sample consists of postoperative ORIF patients who meet the inclusion criteria. A total of 60 participants are selected using probability sampling through a simple random (lottery) method. Thirty patients are assigned to the interventional group and thirty to the control group. Inclusion criteria include patients who have undergone ORIF surgery of the lower extremity, are in the 2nd to 4th postoperative period, can understand and respond to the numerical pain intensity scale, and have no respiratory or cardiac comorbidities. Exclusion criteria include patients with postoperative complications, critically ill patients, and those with a history of allergic reactions.

Validity and Tools for Data Collection

Data are collected using a structured and standardized tool developed through extensive literature review, expert consultation, and evidence-based sources. The tool consists of three sections: socio-demographic variables, clinical variables, and the Numerical Pain Intensity Scale. Content validity of the tool is established through expert review by professors from the Orthopaedic Department and specialists from Medical and Surgical Nursing. Their suggestions are incorporated to ensure clarity, relevance, and adequacy of content.

Ethical Consideration

Ethical approval for the study was obtained from the Institutional Ethics Committee of Madurai Medical College, and official authorization was received from the Department of Orthopaedics. Participant privacy was protected at all stages of the research, with anonymity and confidentiality strictly upheld.

Data Collection Procedure

Following ethical approval and administrative permission, baseline pain levels are assessed using the Numerical Pain Intensity Scale. In the interventional group, two drops of lavender essential oil are applied to tissue paper and participants are instructed to inhale for five minutes, twice daily, from the 2nd to the 4th postoperative day. Pain levels are assessed 30 minutes after each intervention. The control group receives routine postoperative care without aromatherapy. All observations are systematically recorded.

Statistical Analysis

Data analysis incorporated both descriptive and inferential statistical methods. Socio-demographic and clinical characteristics were summarized using frequency distributions and percentages. Between-group differences in postoperative pain were assessed using the independent samples t-test to determine the intervention's effectiveness.

RESULTS:

Socio-demographic Characteristics

Table 1 shows that most participants in both groups were aged above 50 years, with females predominating in the intervention group and males in the control group. The majority of subjects belonged to rural or sub-urban areas. Most participants followed a non-vegetarian diet, had primary or higher secondary education, and were engaged in daily labour. Monthly family income was predominantly below ₹5,000 in both groups. Most subjects reported no adverse habits, and motor vehicle accidents were the commonest cause of injury.

Clinical Characteristics

Table 2 indicates that ankle fractures were the most frequent type of lower limb fracture in both groups, followed by femur fractures. Most patients had incision lengths between 2–5 inches. Intra-medullary nailing was the common method of internal fixation, with surgery mainly involving a single bone. The majority had no previous orthopaedic surgery and no co-morbid illness.

Comparison of Pain Levels

Table 8 reveals no significant difference in pain scores between groups on day one and on day two pre-test ($p > 0.05$). A significant reduction in pain was observed in the intervention group on day two post-test ($p = 0.001$). By day three, pain scores were significantly lower in the intervention group at both pre-test ($p = 0.01$) and post-test ($p = 0.001$). Overall, lavender oil aromatherapy was effective in reducing postoperative pain compared to routine care.

Table: 1 Demographic variables of the Post operative patients.

Demographic variables		Group				χ^2
		Intervention (n=30)		Control(n=30)		
		f	%	f	%	
Age in years	< 20 yrs	4	13.33%	2	6.67%	$\chi2=3.09P=0.54$**(NS)**
	21-30 yrs	2	6.67%	5	16.67%	
	31-40 yrs	5	16.67%	3	10.00%	
	41 -50 yrs	9	30.00%	7	23.33%	
	>50 yrs	10	33.33%	13	43.33%	
Sex	Male	22	73.33%	21	70.00%	$\chi2=0.08P=0.77$**(NS)**
	Female	8	26.67%	9	30.00%	
	Transgender	0	0.00%	0	0.00%	
Place of domicile	Rural	17	56.67%	15	50.00%	$\chi2=0.26P=0.60$**(NS)**
	Sub urban	13	43.33%	15	50.00%	
	Urban	0	0.00%	0	0.00%	
Food habits	Vegetarian	2	6.67%	3	10.00%	$\chi2=0.21P=0.64$**(NS)**
	Non-vegetarian	28	93.33%	27	90.00%	
	Mixed	0	0.00%	0	0.00%	
Education	Non formal Education	8	26.67%	9	30.00%	$\chi2=1.40P=0.70$**(NS)**
	Primary Education	9	30.00%	12	40.00%	

	Secondary Education	9	30.00%	7	23.33%	
	Graduate	4	13.33%	2	6.67%	
Occupation	Daily labour	18	60.00%	16	53.33%	χ2=0.36P=0.83**(NS)**
	Self employee	2	6.67%	3	10.00%	
	Govt employee	0	0.00%	0	0.00%	
	Business	10	33.33%	11	36.67%	
	Others	0	0.00%	0	0.00%	
Income	Rs.<5000	19	63.33%	21	70.00%	χ2=0.90P=0.63**(NS)**
	Rs. 5001- 10000	9	30.00%	6	20.00%	
	Rs. 10001 – 15000	2	6.67%	3	10.00%	
	Rs.15001 and above	0	0.00%	0	0.00%	
Personal habits	Alcoholic	7	23.33%	4	13.33%	χ2=1.38P=0.50**(NS)**
	Drug addiction	0	0.00%	0	0.00%	
	Tobacco chewing	3	10.00%	2	6.67%	
	None of the above	20	66.67%	24	80.00%	
Mode of injury	Motor vehicle accident	18	60.00%	17	56.67%	χ2=2.58P=0.46**(NS)**
	Assault	1	3.33%	0	0.00%	
	Fall from height	4	13.34%	2	6.66%	
	Others	7	23.33%	11	36.67%	

Table-2 D**istribution of post operative patients according to their Clinical variables.**

Clinical variables		**Group**				**χ2**
		Intervention(n=30)		**Control(n=30)**		
		n	%	n	%	
Site of fracture	Femur	10	33.33%	5	16.67%	χ2=2.30P=0.51**(NS)**
	Both bone lower limb	2	6.67%	2	6.67%	
	Ankle	17	56.67%	22	73.33%	
	others	1	3.33%	1	3.33%	
Length of incision	1-2 inches	2	6.67%	0	0.00%	χ2=3.68P=0.29**(NS)**
	2-3 inches	9	30.00%	14	46.67%	
	3-4 inches	9	30.00%	6	20.00%	
	4-5 inches	10	33.33%	10	33.33%	
Type of fixation	Pin and traction	0	0.00%	0	0.00%	χ2=2.00P=0.36**(NS)**
	Plate and screw	1	3.33%	0	0.00%	

	Kirschner wires	0	0.00%	1	3.33%	
	Intramedullary nails	29	96.67%	29	96.67%	
No of bones involved in the surgery	Single bone	21	70.00%	24	80.00%	χ2=0.80P=0.37**(NS)**
	Both bone	9	30.00%	6	20.00%	
	Multiple bone	0	0.00%	0	0.00%	
previous history of orthopaedic surgery	Yes	3	10.00%	1	3.33%	χ2=1.07P=0.30**(NS)**
	No	27	90.00%	29	96.67%	
co morbid illness	Diabetes	3	10.00%	2	6.67%	χ2=0.22P=0.90**(NS)**
	Hypertension	2	6.67%	2	6.67%	
	Osteoporosis	0	0.00%	0	0.00%	
	Others	25	83.33%	26	86.66%	

Table 3: Comparison of mean score on level of pain among post operative patients

Group	Level of pain	Mean	Mean difference	SD	Independent 't'- test
Interventional group	Pre test	6.93	0.10	1.22	**'t'=0.30 p=0.77(NS)**
Control group	Pre test	6.83		1.34	

*** P ≤ 0.05 significant**

Table-4 Comparison of mean on level of pain among post operative patients in intervention group and Control group.

Day	Duration of day	Group				Independent t-test
		interventional		control		
		Mean	SD	Mean	SD	
Day-1	pre test	6.93	1.23	6.83	1.34	t=0.300 P=0.7
	post test	5.73	1.48	6.33	1.35	t=1.63 P=0.10
Day-2	pre test	6.10	1.49	6.43	1.25	t=0.93 P=0.35
	post test	5.03	.81	6.03	1.13	t=3.94 P=0.001*
Day-3	pre test	5.73	.69	6.40	.93	t=3.14 P=0.01*
	post test	4.00	.64	5.93	.91	t=9.22 P=0.001*

*** P ≤ 0.05 significant**

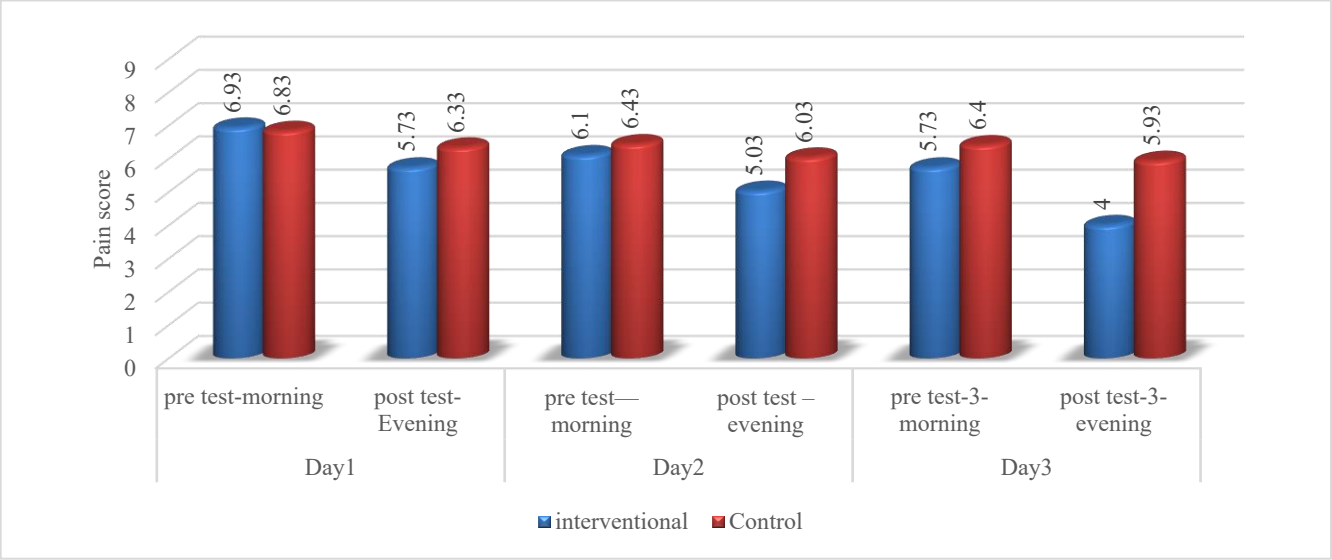

Figure 1: Level of pain among post operative patients

DISCUSSION:

At baseline, pain intensity scores were similar across the intervention and control groups, with no significant differences observed during pre-intervention assessments on the first and second postoperative days ($p > 0.05$), establishing initial comparability. After implementing lavender essential oil dry inhalation, the intervention group experienced a marked and sustained decrease in pain levels. This effect became statistically significant on the second postoperative day in post-intervention measurements ($t = 3.14$, $p = 0.001$) relative to controls. The pain-relieving benefits intensified further on the third postoperative day, evidenced by significant between-group differences in both pre-intervention ($p = 0.01$) and post-intervention scores ($t = 9.22$, $p = 0.001$). These findings demonstrate that dry inhalation of lavender essential oil provides superior postoperative pain relief for ORIF patients compared to conventional management.

CONCLUSION:

Lavender oil dry inhalation produced statistically significant pain relief in ORIF patients versus routine care, showing marked improvements on postoperative days 2 and 3. This non-invasive, cost-effective method supports orthopaedic pain management.

RECOMMENDATIONS

The study demonstrated that dry inhalation aromatherapy with lavender essential oil significantly reduced postoperative pain among patients following open reduction and internal fixation. Compared to standard postoperative care, the intervention group exhibited a consistent and statistically significant decrease in pain intensity, with greater improvement noted on the second and third postoperative days. These findings suggest that lavender oil inhalation is a safe, non-invasive, cost-effective, and easily administered complementary therapy for enhancing postoperative pain management in orthopedic patients.

LIMITATIONS

The study's generalizability was limited due to its relatively small sample size and single-center setting. The assessment of pain was based on self-reported measures, which could be affected by individual differences in perception. Moreover, the short follow-up period restricted the ability to evaluate the long-term impact of aromatherapy on postoperative pain and overall recovery.

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Cite this Article: Pandi Selvi (2025). A study to evaluate the effectiveness of aromatherapy with dry inhalation of lavender essential oil on pain among postoperative orthopaedic patients in the orthopaedic ward of Government Rajaji Hospital, Madurai. *International Journal of Innovative Research in Health Science*, 1(13), 1-8. https://doi.org/10.63349/ijirhs.202472.