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COMPARING THE EFFICACY AND SIDE EFFECTS OF PARACETAMOL AND TRAMADOL FOR POST-OPERATIVE ANALGESIA IN HYSTERECTOMY

Original Research

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ABSTRACT

Background: Hysterectomy is one of the most commonly performed gynecological surgeries and often leads to significant postoperative pain that can delay recovery if not managed effectively. Ensuring optimal analgesia is vital to enhance patient comfort and minimize complications. Paracetamol and tramadol are frequently used for postoperative pain control, yet their comparative effectiveness and safety profiles remain areas of ongoing clinical evaluation.

Objective: To compare the efficacy and side effect profiles of intravenous paracetamol and tramadol in relieving postoperative pain following abdominal hysterectomy.

Methods: A comparative cross-sectional study was conducted at three tertiary care hospitals in Lahore. A total of 70 patients undergoing elective abdominal hysterectomy were selected through convenience sampling and evenly divided into two groups: 35 received intravenous paracetamol and 35 received intravenous tramadol. Pain intensity was assessed using the Visual Analogue Scale (VAS) at 15 minutes, 30 minutes, 1 hour, and 2 hours postoperatively. Data were also collected on the incidence of adverse effects, patient satisfaction, and the requirement for additional analgesia.

Results: Tramadol demonstrated superior pain relief at 1 hour (VAS: 1.71 ± 0.82 vs. 2.32 ± 0.58; $p = 0.01$) and 2 hours (VAS: 1.51 ± 0.61 vs. 2.63 ± 0.59; $p = 0.01$) postoperatively compared to paracetamol. However, 37.1% of patients in the tramadol group experienced nausea and vomiting, 25.7% reported drowsiness, and 17.1% had headaches. In contrast, the paracetamol group had fewer side effects and required more frequent additional analgesia (30% vs. 20%). Patient satisfaction was higher in the tramadol group (85%) than in the paracetamol group (75%).

Conclusion: Tramadol offers more effective short-term analgesia following hysterectomy but is associated with a higher rate of side effects. Paracetamol, while milder in analgesic effect, is better tolerated. Personalized pain management strategies should consider both efficacy and safety to optimize postoperative outcomes.

Keywords: Analgesia, Hysterectomy, Pain Management, Paracetamol, Postoperative Pain, Tramadol, Treatment Outcome.

INTRODUCTION

Each year, more than 100 million surgical procedures are performed globally, encompassing both inpatient and outpatient interventions. Among these, over 80% of patients report experiencing postoperative pain, with approximately 86% describing it as moderate to severe or even extreme in intensity (1). Postoperative pain remains a significant clinical challenge, impacting patient recovery, satisfaction, and long-term outcomes. Hysterectomy, a commonly performed gynecological procedure, serves as an ideal model for evaluating postoperative pain due to the diversity of surgical techniques employed, each associated with varying degrees of nerve injury (2,3). It is the second most frequently performed surgery worldwide after cesarean section and is often indicated for benign conditions such as uterine fibroids or abnormal uterine bleeding (4). Despite its routine nature, abdominal hysterectomy is associated with substantial postoperative discomfort that can hinder recovery. Uncontrolled pain may contribute to prolonged hospital stays, delayed mobilization, increased risk of venous thromboembolism, the development of chronic postsurgical pain, and reduced overall patient satisfaction (5). Pain after surgery is a complex and multifactorial experience, involving both peripheral and central mechanisms. Surgical trauma triggers inflammatory responses and activates afferent nociceptive pathways, producing a cascade of sensory, psychological, autonomic, and behavioral reactions (6). In addition to its physiological impact, surgery can be emotionally distressing, amplifying the perception of pain during the recovery phase (7).

The uterus has a complex neural supply, with sympathetic innervation originating from the thoracic spinal segments (T7–T8) and parasympathetic fibers from the sacral segments (S2–S4), converging at the cervical ganglion of Frankenhauser. These nerves not only innervate the uterus but also extend to adjacent pelvic organs such as the bladder and vagina. Consequently, regional anesthesia targeting the lower spine may fail to offer complete pain relief, particularly in procedures involving extensive tissue manipulation, regardless of whether the hysterectomy is performed laparoscopically or via open surgery (8,9). Pain assessment in clinical settings is typically performed using the Visual Analog Scale (VAS), ranging from 0 (no pain) to 10 (worst imaginable pain), recorded at intervals post-intervention to gauge analgesic efficacy over time (10). In this context, a range of analgesic agents have been evaluated for their effectiveness in postoperative hysterectomy pain control. Paracetamol, with its favorable safety profile, is widely used and well tolerated across age groups and comorbid conditions. Its opioid-sparing effect makes it particularly suitable for multimodal analgesia regimens (6,7). Tramadol, a synthetic opioid, has demonstrated efficacy in managing moderate to severe postoperative pain, although its side-effect profile, including nausea and dizziness, can limit its utility as a first-line agent (11,12).

Various pharmacologic strategies have been explored to enhance postoperative pain control in hysterectomy patients. A study demonstrated that, pregabalin, alone or in combination with ketamine, significantly reduced pain scores in the early postoperative period following abdominal hysterectomy (13). Another study found that, tapentadol provided similar or slightly better analgesia than oxycodone within 72 hours postoperatively (14). Additionally, a study reported that, gabapentin offered superior pain control compared to oxycodone, with reduced need for rescue analgesia and fewer episodes of postoperative nausea and vomiting (PONV), along with less intraoperative blood loss (15). Similarly, a study further evaluated the potential interaction between ondansetron and acetaminophen, noting that antiemetics might influence analgesic effectiveness (16). While tramadol may offer greater analgesic efficacy, its adverse effects warrant cautious use. In contrast, paracetamol, though milder in effect, remains a safer option with fewer complications. The choice of analgesic must therefore be individualized, balancing effectiveness with tolerability. Given the complex nature of postoperative pain and the limitations of single-agent therapies, multimodal pain management strategies are increasingly advocated. These approaches integrate multiple pharmacologic pathways to enhance analgesia while minimizing opioid dependence. This study aims to evaluate and compare the effectiveness of paracetamol and tramadol in postoperative pain control among patients undergoing abdominal hysterectomy, with the objective of identifying safer and more effective strategies for enhancing postoperative recovery and patient comfort.

METHODS

This study employed a descriptive cross-sectional design to evaluate and compare the efficacy and side effect profiles of intravenous paracetamol and tramadol for postoperative pain management in female patients undergoing hysterectomy. The research was conducted

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across three major tertiary care hospitals in Lahore: Chaudhry Muhammad Akram Teaching & Research Hospital, Jinnah Hospital Lahore, and Mayo Hospital Lahore. The duration of the study spanned four months following formal approval of the research synopsis by the institutional review board. Ethical approval was obtained from the relevant institutional ethical committees, and informed consent was obtained from all participants prior to their inclusion in the study, ensuring compliance with the principles of the Declaration of Helsinki. The sample size was calculated using OpenEpi software, applying the formula: $n = (Z\alpha/2 + Z\beta)^2 \times 2\sigma^2 / (m_1 - m_2)^2$ Based on this, a total of 70 participants were recruited through a non-probability convenience sampling technique. Inclusion criteria comprised female patients of all age groups admitted for hysterectomy who received either intravenous paracetamol or tramadol for postoperative pain relief and consented to participate in the study. Patients were excluded if they received analgesics other than the two agents under study, declined to give consent, or underwent hysterectomy for non-gynecological reasons.

Data collection was carried out using a structured questionnaire administered to eligible participants in the immediate postoperative period. Pain intensity was assessed using the Visual Analogue Scale (VAS) at four intervals: 15 minutes, 30 minutes, 1 hour, and 2 hours postoperatively. Additional data were gathered on adverse effects, the need for additional analgesia, and patient satisfaction regarding pain management. These responses were documented by the researchers in a standardized and uniform manner. All data were entered and analyzed using IBM SPSS version 26. Descriptive statistics were applied to summarize the data. Frequencies and percentages were calculated for categorical variables, while continuous variables were reported as means with standard deviations or medians with interquartile ranges, depending on data distribution. The analysis aimed to identify trends and differences in pain relief outcomes and tolerability between the two analgesic agents.

RESULTS

The demographic characteristics of patients in both treatment groups were largely comparable. The mean weight in the tramadol group was 67.89 ± 10.4 kg, while in the paracetamol group it was 68.58 ± 11.4 kg (p = 0.792). Average height was nearly identical between groups, with patients in the tramadol group measuring 5.186 ± 0.394 feet and those in the paracetamol group at 5.189 ± 0.336 feet (p = 0.974), indicating no significant anthropometric differences at baseline. Various types of hysterectomy were observed across the sample, including total abdominal hysterectomy, laparoscopic-assisted vaginal hysterectomy, and vaginal hysterectomy, distributed between both study groups. The average surgical duration among all patients was 114.94 ± 33.77 minutes. Multiple anesthesia techniques were employed, with visual data depicting the anesthesia types used across the study population. Pain intensity was evaluated postoperatively using the Visual Analog Scale (VAS) at 15 minutes, 30 minutes, 1 hour, and 2 hours. Although pain scores between the groups did not reach statistical significance at 15 minutes (2.40 ± 0.88 vs. 2.66 ± 1.61; p = 0.41) and 30 minutes (1.69 ± 1.07 vs. 1.89 ± 0.32; p = 0.30), significant differences emerged at later intervals. At 1 hour postoperatively, patients in the tramadol group reported significantly lower pain (1.71 ± 0.82) compared to the paracetamol group (2.32 ± 0.58) (p = 0.01). This difference was sustained at 2 hours, with tramadol patients scoring 1.51 ± 0.61 versus 2.63 ± 0.59 in the paracetamol group (p = 0.01), suggesting superior analgesic efficacy of tramadol during this period.

The requirement for additional analgesia was recorded and visually depicted, revealing a higher need for supplementary pain relief in the paracetamol group, which aligns with lower pain control efficacy. Side effect profiles varied notably between groups. In the tramadol group, nausea and vomiting were reported in 37.14% of patients, drowsiness in 25.7%, and headache in 17.14%. In contrast, the paracetamol group exhibited nausea and vomiting in 25.7% of patients but showed no incidence of drowsiness or headache. No cases of dizziness or constipation were reported in either group, indicating an acceptable safety profile for both analgesics, with paracetamol demonstrating a more favorable tolerability.

Table 1: Summary of patient demographics characteristics

	Group 1 (Tramadol)	Group 2 (Paracetamol)	P-value
Weight (kg) Mean ± (SD)	67.894±10.4	68.586±11.4	0.792
Height (feet) Mean ± (SD)	5.186±0.394	5.189±0.336	0.974

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Table 2: Comparison of Postoperative VAS Scores Between Tramadol and Paracetamol Groups at Different Time Intervals

VAS	Group 1 (Tramadol) Mean± SD	Group 2 (paracetamol) Mean± S D	P-value
15 mins	2.40±0.881	2.66±1.608	0.41
30 mins	1.69±1.078	1.89±0.323	0.30
1 hour	1.71±0.825	2.32±0.583	0.01
2 hours	1.51±0.612	2.63±0.598	0.01

Table 3: Comparison of Side Effect Incidence Between Tramadol and Paracetamol Groups

Side effects	Group 1 (Tramadol)	Percentage	Group 2 (Paracetamol)	Percentage
Nausea and Vomiting	13	37.14%	9	25.7%
Dizziness	0	0%	0	0%
Drowsiness	9	25.7%	0	0%
Constipation	0	0%	0	0%
Headache	6	17.14%	0	0%

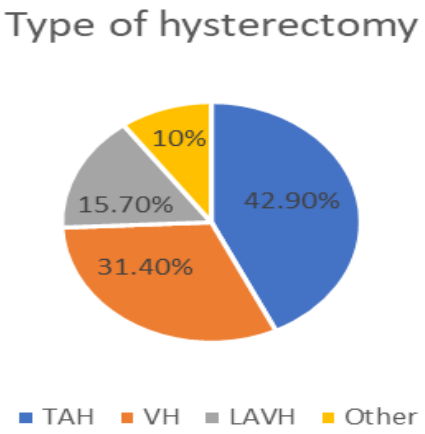

Figure 1 Type of Hysterectomy

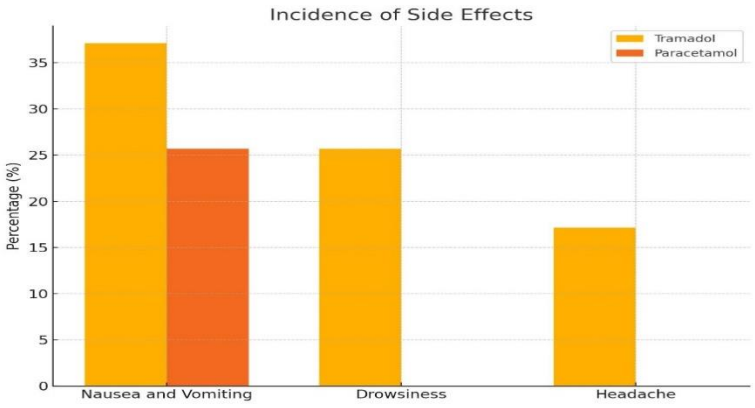

Figure 2 Incidence of side Effects

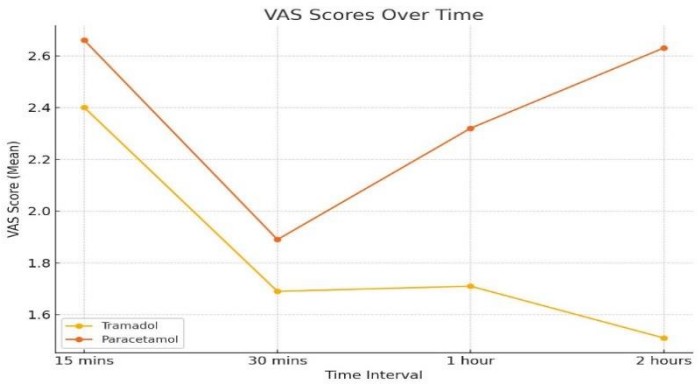

Figure 3 VAS Scores Over Time

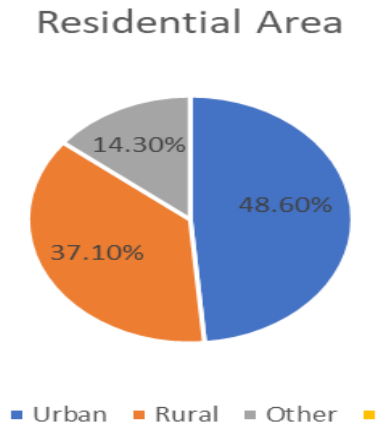

Figure 4 Residential Area

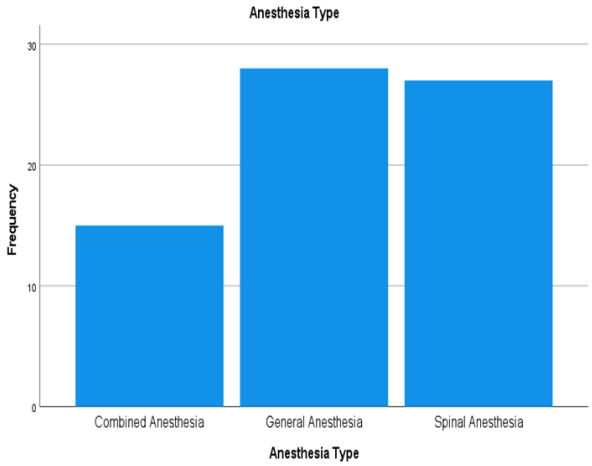

Figure 5 Anesthesia Type

DISCUSSION

Postoperative pain relief remains a cornerstone in the management of patients undergoing hysterectomy, as effective analgesia not only reduces discomfort but also facilitates early mobilization and improved surgical recovery. The findings of this study reinforce the clinical utility of both tramadol and paracetamol as viable analgesic options following abdominal hysterectomy. However, tramadol demonstrated slightly superior efficacy in reducing early postoperative pain, particularly at the 1-hour and 2-hour time points, where statistically significant differences in Visual Analogue Scale (VAS) scores were observed. This supports prior evidence suggesting that tramadol, due to its dual-action mechanism involving both opioid and monoaminergic pathways, may offer enhanced analgesic control in the immediate postoperative setting (5,16). The need for additional analgesia further substantiated tramadol's clinical benefit, as only 20% of patients in the tramadol group required supplementary pain relief compared to 30% in the paracetamol group. This aligns with earlier investigations indicating that tramadol effectively reduces the postoperative requirement for additional opioid analgesics (17). Although paracetamol is recognized for its safety and favorable tolerability profile, particularly in patients with comorbidities, its analgesic ceiling may be insufficient for moderate to severe postoperative pain unless combined with adjunct agents. Hence, combining paracetamol with other non-opioid agents or low-dose opioids could be an effective strategy to enhance pain control while minimizing adverse effects.

Despite tramadol's higher incidence of side effects such as nausea, vomiting, drowsiness, and headache, patient satisfaction remained higher in the tramadol group (85%) compared to the paracetamol group (75%). This finding illustrates the delicate balance between efficacy and tolerability that must be considered in postoperative pain management (18). Patients often value adequate pain control over mild-to-moderate adverse effects, provided these side effects are transient and manageable. These results resonate with previous studies that support the use of tramadol, either alone or in multimodal regimens, as an effective alternative to traditional opioid therapy when titrated correctly (19,20). Notably, the study did not reveal statistically significant differences in VAS scores at 15 and 30 minutes postoperatively, suggesting that the onset of action and analgesic peak effects for both drugs may overlap in the immediate short term. However, tramadol's sustained efficacy beyond the early postoperative period potentially contributes to better overall pain relief and reduced need for further intervention (21). This nuanced distinction becomes critical when tailoring pain management protocols, especially in fast-track recovery programs. The study contributes valuable clinical insights to the growing discourse on optimizing postoperative analgesia in hysterectomy patients. A key strength of this research lies in its real-world applicability, with data drawn from multiple tertiary care centers and a clearly defined patient population. Additionally, the study employed standard pain assessment tools and consistent data collection intervals, enhancing the reliability of the reported outcomes.

However, certain limitations must be acknowledged. The use of a non-probability convenience sampling method may limit the generalizability of findings, as the selected population may not fully represent the broader surgical demographic. Furthermore, the relatively small sample size restricts subgroup analysis and may reduce the power to detect smaller differences in efficacy or side effects. The absence of long-term follow-up also precludes conclusions regarding chronic postoperative pain or delayed adverse events.

Moreover, while side effects were recorded, their severity and duration were not quantified, which could have provided deeper insight into patient tolerability and experience. Future studies should consider larger, randomized controlled trials comparing tramadol and paracetamol both as monotherapy and in combination with other analgesics. Such studies should aim to stratify patients based on pain thresholds, surgical complexity, and comorbid profiles to personalize analgesic strategies (22). Furthermore, assessing long-term pain outcomes, functional recovery, and quality of life will enhance the clinical relevance of future research. Overall, this study underscores the need for individualized analgesic approaches that balance efficacy with safety and patient preferences. By evaluating two widely used agents in a common surgical scenario, the findings contribute meaningfully to evidence-based postoperative pain protocols and promote better recovery trajectories in women undergoing hysterectomy.

CONCLUSION

This study concludes that while intravenous oxytocin remains a critical agent in the prevention of postpartum hemorrhage during cesarean section under spinal anesthesia, its significant cardiovascular effects—particularly hypotension and reflex tachycardia—warrant careful consideration. The vasodilatory action of oxytocin, though effective in promoting uterine contraction, can compromise cardiovascular stability, especially in patients with preexisting cardiac conditions. These findings underscore the importance of individualized dosing strategies and the potential need for alternative or adjunct uterotonic agents in high-risk populations. Clinicians must balance the therapeutic benefits of oxytocin with its hemodynamic implications to ensure maternal safety and optimize obstetric outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Faheem Asif	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Areeba Nadeem	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Imran	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Muhammad Muzamil	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Arslan Afzal	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Rubama Javed	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Jawaria Barkat*	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Ajmal Shahbaz	Writing - Review & Editing, Assistance with Data Curation

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