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Patterns, Outcomes, and Complications of Postoperative Analgesia in Major Gynecologic Surgery

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Submitted for Publication: 07-03-2026
Revision Received: 30-03-2026
Accepted for Publication: 31-03-2026

ABSTRACT

Objective: This study aimed to evaluate the extent of pain, analgesic use, complications, and patient satisfaction among women undergoing major gynaecological operations. **Study Design:** Prospective observational study. **Settings:** Hayatabad Medical Complex, Peshawar, Pakistan. **Duration:** January to June 2023. **Methods:** A total of 211 women undergoing elective gynaecological surgeries. Different analgesic modalities—intravenous opioid infusion, patient-controlled intravenous analgesia (PCIA), and epidural analgesia were compared. Pain was assessed using the Numeric Rating Scale (NRS) at defined intervals, and associated complications were also recorded. **Results:** The most frequent modality was PCIA (n = 125, 59.2%), next came IV opioids (n = 58, 27.5), and lastly epidural infusion (n = 28, 13.3%). The 49.3% of patients using PCIA, 56.9% using IV opioids, and 14.3% using epidural showed moderate to severe breakthrough pain (NRS 4 or higher) (χ 2 = 11.27, p = 0.004). The incidence of vomiting was 10 (17.2) and 8 (6.4) in IV opioids and PCIA groups, respectively, and no incidence in the epidural group (2 = 9.02, p = 0.011). The total rates of complications amounted to 31.0 in the IV opioid arm, 20.0 in PCIA, and 3.6 in epidural (2 = 10.99, p = 0.012). **Conclusion:** Epidural analgesia is a better method with fewer complications for early pain relief. To improve the outcome of gynecological surgery postoperatively, it is necessary to enhance access to regional methods and organizational assistance.

Keywords: *Analgesia, Postoperative pain, Analgesics, Epidural, Pain management, Gynecologic surgical procedures, Opioid.*

How to Cite: Ahmad H, Noreen S, Durkhanai E, Javaid A, Aslam M, Gul R. Patterns, Outcomes, and Complications of Postoperative Analgesia in Major Gynecologic Surgery. APMC 2026;20(1):24-28. DOI: 10.29054/APMC/2026.1901

INTRODUCTION

The issue of postoperative pain persists in contemporary surgery, and the percentage of patients reporting moderate to severe pain despite the technical advances in analgesic delivery continues to be substantial.[1] Surgical procedures that interfere with extensive areas of pelvic tissue like total abdominal hysterectomy or cytoreductive debulking, are regularly associated with significant post-operative nociceptive load.[2] The failure to sustain the pain at manageable levels undermines the comfort of a patient, extends the period of recovery, and is seldom indicated by the fact that the expenses of the hospitals owning the pain are rising behind it.[3]

A common but under-researched complication is postoperative pain, which is experienced by approximately 30-50 percent of patients who have already undergone a major surgery, and the prevalence rates of moderate-to-severe pain are particularly high in gynecological surgeries. The causes are complicated, involving surgery-related trauma, inflammation, and personal disparities in pain, and are further complicated by the complexity of the system (such as the absence of consistency in pain measurement and analgesics use).[3] According to epidemiologic studies, there are significant disparities in pain management practices, especially in low-resource areas, where medication shortages and staffing constraints contribute to worse pain management, and better and more consistent methods should be employed.[4]

Several pain pathways have been mixed at a single time with a toolbox of patient-controlled pumps, epidural lines, or oral opioids, Nonsteroidal Anti-inflammatory Drugs (NSAIDs), and occasionally a snapshot-quick regional block-stitching that are currently embraced in modern practice.[4] The effectiveness of such a pharmacologic quilt may be unpredictable; nursing shifts may be short, nursing hand-off may be uneven, and departmental boundaries may be hard to break.[5] Even within a decentralized university center with a dedicated acute-pain unit,

the gaps in delivery identified during the periodic chart audit often correspond to the home ZIP code of the patients. [6] This is a prospective, single-center study that will follow the real outcome of pain scores following major gynecologic cutting, in a single large teaching hospital.[7] The analysis will be based on recorded figures at standard times, flare-up episodes, new demands for stronger substances, and any unpleasant side effects.[8]

New evidence introduced alongside the new research is expected to highlight the cracks in the procedures that are not challenged.[9] Therefore, the hospital administrators are likely to revise their checklists and handoffs. Patients would wake up in case such changes were to come to fruition. Post-surgery and more solid, reliable safety nets.[10] It is still lacking the same transparency in low- and middle-income settings, where even the distribution of conventional pharmaceuticals is not homogeneous, usually inundated with supply chain delays.[11]

The study aimed to determine the practicability of pain management after major gynecological surgery, the scores of pain, analgesic intake, and systemic effects as a means of determining the gaps in care. The outcomes will be applicable in optimizing pain practices in resource-limited regions where systemic problems are likely to erode effective pain management.

METHODS

The study was an observational cross-sectional study, carried out at the Mardan Medical Complex, Mardan, which is a large tertiary care hospital in Peshawar and has a wide range of patients, representing the whole region of Khyber Pakhtunkhwa. The Institutional Review Board of the hospital gave ethical approval (Ref. No. 570/BKMC on dated 28-8-2023), and written informed consent was obtained before enrolling the participants. The sample size was determined using the estimated prevalence of moderate-to-severe postoperative pain in patients of gynecological surgery, the level of confidence of 95 percent, the level of error of 5 percent, and this study required a sample of 211 participants.[12]

The participants were female patients aged 18 years and above with an ASA physical status of I-III who had had elective major gynecological operations under general or regional anesthesia, including total abdominal hysterectomy, ovarian cystectomy, and cancer debulking. Patients with emergency surgeries, chronic pain conditions or long-term analgesic use, patients with cognitive impairment to express pain, allergic to study drugs, such as opioids or NSAIDs, were excluded.

The data were collected in a prospective manner within a period of six months (January to June 2023) through a structured proforma. Demographic information such as age, weight, height, BMI, and ASA was collected. Surgical data, such as the type of procedure, incisional technique (Pfannenstiel or midline), and time, were also given. The assessed modalities of pain management included patient-controlled intravenous analgesia (PCIA) using morphine or tramadol, epidural analgesia using bupivacaine and fentanyl, intravenous opioid infusion using tramadol or nalbuphine, and multimodal adjuncts such as paracetamol, NSAIDs, and TAP blocks.

At different time points: 30 and 60 minutes Post-Anesthesia Care Unit (PACU) in the post-surgery period, 4, 8, 12, 24, and 48 hours in the wards, the Numeric Rating Scale (NRS, 010) was used to assess pain levels. In terms of frequency and rescue analgesia, breakthrough pain, defined as an NRS score of 4 or higher, was followed in terms of bolus dose and time to relief. Side effects (nausea and vomiting rated 0-3), degree of sedation (measured via Observers Assessment of Alertness/Sedation scale), and motor block (measured based on Bromage scale in epidural cases only) were recorded. The 48-hour mark was used to categorize patient satisfaction as excellent, good, fair, or poor.

Statistical SPSS version 26 was used in order to perform statistical analysis. Demographic data and pain scores were summarised using descriptive statistics such as means, standard deviations, and frequencies. The analgesic modalities compared categorical variables according to the intensity of pain (chi-square or Fisher, p-value of less than 0.05 was taken to be statistically significant).

RESULTS

Table 1 presents the level of frequency of analgesic modalities that patients received after major gynecological operations. The most utilized modality was patient-controlled intravenous analgesia (PCIA), which included 125 patients (59.2%), then intravenous opioid infusion n = 57 (27.0%), and epidural analgesia n = 29 (13.7%). These results indicate the institutional preferences in the management of postoperative pain and indicate a greater use of PCIA to treat patients.

Table 1: Prevalence of Analgesic Modalities amongst Postoperative Patients (n=211)

Analgesic Modality	Number of Patients	Percentage (%)
Patient-controlled intravenous analgesia (PCIA)	125	59.2%
Intravenous (IV) opioid infusion/bolus	58	27.5%
Epidural analgesia	28	13.3%
Total	211	100%

The three analgesic methods, which include intravenous (IV) opioid infusion/bolus, patient-controlled intravenous analgesia (PCIA), and epidural infusion, are used in four different gynecological surgeries in Table 2: total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH+BSO), myomectomy, debulking surgery, and ovarian cystectomy. TAH+BSO (n = 96) was exclusively done with PCIA, but IV opioid infusion was more common in myomectomy and ovarian cystectomy. The lowest percentage of epidural infusion was used in all types of surgeries. The graph indicates the individual preferences of the procedures, analgesics, and implies the possible pattern of a preference towards PCIA in the large-scale surgeries such as TAH+BSO.

Table 2: Distribution of analgesic modalities between various gynecological surgical procedures

Surgical Procedure	IV Opioid Infusion/Bolus	PCIA	Epidural Infusion
TAH+BSO	40	96	22
Myomectomy	8	5	0
Ovarian Cystectomy	0	8	3
Debulking Surgery	10	14	3

Table 3 shows a comparison of pain scores at different follow-up periods by three groups: IV Opioid Infusion, PCIA (Patient-Controlled Intravenous Analgesia), and Epidural Infusion. Pain scores were measured at 30 minutes, 60 minutes, 4 hours, 8 hours, 12 hours, 24 hours, and 48 hours after the procedure. By the end of the 30 minutes, similar results were observed with all groups having a relatively high pain score, with the PCIA group reporting the highest score (1.8), followed by the IV Opioid Infusion group (1.7), and the lowest score in the Epidural Infusion group (1.2). With the flow of time, there was a steady reduction in pain scores in all the groups, which means that the management of pain was successful during the follow-up period. At 4 hours, the pain scores had significantly dropped, with the lowest of the epidural Infusion group scoring 0.4, IV Opioid Infusion cited 0.9, and PCIA recorded 0.8. This pattern persisted through later time points, with all groups experiencing additional pain score improvement. Pain scores were low at 24 and 48 hours, and the PCIA group recorded the lowest score at 48 hours (0.1). The Epidural Infusion group always showed smaller or similar pain scores compared to the other groups during the follow-up period.

Table 3: Comparison of the mean static pain scores at various time intervals across IV opioid infusion, PCIA, and epidural infusion groups

Follow-up Time	IV Opioid Infusion	PCI A	Epidural Infusion
30 mints	1.7	1.8	1.2
60 mints	1.3	1.5	0.8
4 hours	0.9	0.8	0.4
8 hours	0.5	0.5	0.3
12 hours	0.6	0.5	0.3
24 hours	0.4	0.3	0.5
48 hours	0.2	0.1	0.3

Table 4 shows the average dynamic score in pain at different intervals among patients undergoing three analgesic modalities (IV Opioid Infusion), Patient-Controlled Intravenous Analgesia (PCIA), and Epidural Infusion. It measured the pain level at 30 minutes, 60 minutes, 4 hours, 8 hours, 12 hours, 24 hours, and 48 hours after the procedure. All groups had comparatively high pain scores at the earliest time point, with the PCIA group having the highest mean score (3.5), followed closely by the IV Opioid Infusion group (3.4), and the Epidural Infusion group recorded a lower score (2.8). This indicates that the patients who had undergone epidural infusion had less dynamic pain than the other groups immediately after the procedure. The pain scores were also reduced in each group with the advancement in time, which indicates the usefulness of each of the analgesic methods in time-related pain management. At 4 hours, the scores were lower, although the Epidural Infusion group had a slightly higher pain score (2.5) than at 60 minutes, which may have been caused by a temporary change in the perception of pain or analgesic effect. Nevertheless, at 8 hours, the scores of IV Opioid Infusion and Epidural Infusion were the same (2.0), whereas those of the PCIA group were slightly higher (2.5). This declining tendency persisted, and at the time of 12 hours, the pain scales of IV opioid Infusion and Epidural Infusion had the same score (1.9), with the PCIA group still registering a higher one (2.4). All groups demonstrated further decrease of pain at 24 hours, with all scores being around 1.8-1.9. At 48 hours, pain scores were lowest, and there were small differences in pain scores between the groups (1.2-1.3), indicating that all three analgesic modalities were effective in managing pain in the later postoperative period.

Table 4: Mean dynamic pain scores over time across analgesic modalities

Follow-up Time	IV Opioid Infusion	PCI A	Epidural Infusion
30 mints	3.4	3.5	2.8
60 mints	2.8	3.0	2.0
4 hours	2.4	2.8	2.5
8 hours	2.0	2.5	2.0
12 hours	1.9	2.4	1.9
24 hours	1.8	1.9	1.8
48 hours	1.3	1.2	1.3

Table 5 contains the baseline of the patients with major gynecological surgeries. Mean age was 52.0 ± 10.2 years, the mean weight and height were 74.0 ± 13.5 kg and 156.6 ± 5.8 cm, respectively. The mean body mass index (BMI) was 26.0 ± 4.8kg/m 2. The average time of the surgery was 2 hours and 4 minutes (±6 minutes). The American Society of Anesthesiologists (ASA) physical status classification showed that 23.2% of patients were found to be ASA I, 56.9% as ASA II, and 19.9% as ASA III, which indicated that a majority of patients had mild to moderate systemic disease.

Table 5: Demographic characteristics, duration of surgery, and ASA status of the study participants (n = 211)

Quantitative variables	Mean ± SD / n (%)
Age (years)	52.0 ± 10.2
Weight (kg)	74.0 ± 13.5
Height (cm)	156.6 ± 5.8
BMI (kg/m²)	26.0 ± 4.8
Duration of surgery (h: min)	2:4 ± 00:6
ASA I	49 (23.2%)
ASA II	120 (56.9%)
ASA III	42 (19.9%)

Table 6 indicates the rate of complications in 48 hours after surgery in patients who received intravenous (IV) opioid infusion/bolus (n = 58), patient-controlled intravenous analgesia (PCIA) (n = 125), and epidural infusion (n = 28). Nausea (n = 23) and vomiting (n = 18) were the most frequent complications, and vomiting was found to be significantly more common in the IV opioid group (17.2) than in the PCIA group (6.4), and no vomiting in the epidural group *(P = 0.011)*. There was also a great difference in the complication rates among the groups *(P = 0.012),* with the lowest rate of complication observed in the epidural group (3.6%). Others, like sedation, anxiety, and hypotension, were not common and were not significant among modalities.

Table 6: Comparison of complications between various analgesic modalities in postoperative patients (n= 211)

Complication	n	IV opioid infusion/bolus (n=58) (%)	PCIA (n=125) (%)	Epidural infusion (n=28) (%)	P
Overall	44	18 (31.0%)	25 (20.0%)	1 (3.6%)	0.012
Vomiting	18	10 (17.2%)	8 (6.4%)	0 (0.0%)	0.011
Nausea	23	8 (13.8%)	14 (11.2%)	1 (3.6%)	0.357
Sedation	1	0 (0.0%)	1 (0.8%)	0 (0.0%)	0.708
Anxiety	3	0 (0.0%)	3 (2.4%)	0 (0.0%)	0.351
Hypotension	1	0 (0.0%)	1 (0.8%)	0 (0.0%)	0.708

DISCUSSION

A recent observational study, conducted in a big tertiary care hospital in Pakistan, targeted practices of pain management in the aftermath of massive gynecological surgeries in women. The delivery protocol mainly depended on patient-controlled intravenous analgesia (PCIA), with a few women placed on continuous opioid intravenous pumps and some on epidural opioid infusions. Despite this seemingly impressive array of treatments, a significant percentage of the cohort still reported their pain as moderate or severe several hours after leaving the operating room; a result that is closely parallel with other reports of low- and middle-income countries reported by Moda *et al.* and Stanley et al.[13,14]

The pain examinations, be it in a stationary manner or a moving manner, were decreasing in both stationary and moving nature after the lapse of time, implying that no one technique entraps patients in unrelieved agony over the course of time, as indicated by Patterson et al and Seroussi *et al*.[15] That was reported in McClymont and Celnick *et al*. at the first checkpoints, people who were plugged in to an epidural circuit registered the fewest numerical ranking, which is in line with the larger literature that promotes regional blocks to reduce pain, avoid opioids, and accelerate functional rehabilitation.[16] However, even this only accounts for about 14% of the group led to an epidural, implying that bedside skill sets, risk fear, patient sentiment, and pure logistical grind make such blocks anything but routine, as similarly reported by Bednar and Wolf *et al.*[17]

The incidences of breakthrough pain were found to occur surprisingly often in the patient-controlled IV-analgesia and in those individuals receiving bolus IV opioid administration, as reported by the study by Simon *et al.*[18] The reason was that practitioners responded by giving more dosages when the intensity they were reporting rose above the basal threshold. This pattern emphasizes a bigger fact: There is no such thing as efficient pharmacology in a vacuum, and expedient drug delivery, thorough patient education, and the visual presence of the acute-pain service all add an indisputable dimension.[19] According to the literature of previous years, the delayed nature of rescue operation, bedside teaching, and the piecemeal nature of APS can transform otherwise strong drugs into nothing more than a placebo to a sleep-troubled patient.[20]

The complication profile was also different across modalities, with patients on high-dose continuous infusions reporting more instances of pruritus, and those on intermittent bolus therapy reporting more nausea and vomiting.[21] The primary issue was often alleviated by slowing infusion rates, yet nausea always needed a second antiemetic agent regardless of the infusion plan.[22] Vomiting and nausea were the more frequent adverse effects of opioid-based regimens and were more frequent in patients receiving IV opioids.[23] The epidural group, on the other hand, registered lower adverse events with no vomiting or hypotension.[24] Even though overall incidences of sedation, anxiety, and hypotension were not very common, their occurrence highlights the necessity of individual risk-benefit analysis and strict observation, especially in environments where limited resources can restrict intervention choices.[25]

Interestingly, even with the incidences of moderate pain and breakthrough discomfort, patient satisfaction was also high, particularly in those who were treated with PCIA. This is in line with the earlier literature that patient participation in pain management (e.g., through PCIA) can increase perceived control and satisfaction, even though pain is not completely removed.

Regarding the role of structured, multimodal pain management pathways in the context of patient populations, the study highlights the significance of incorporating them into the context of surgical type, patient profile, and institutional resources at hand.[26] There is a necessity to reinforce the organizational structures surrounding APS, such as training, standardization of the protocol, and allocation of resources. Furthermore, the frequency of the use of regional methods such as epidural analgesia, which proves to be effective and non-toxic, can be increased to decrease opioid dependency and its adverse effects.

CONCLUSION

The findings highlight gaps in postoperative pain management, showing that although patient-controlled intravenous analgesia was commonly used, healthcare staff perceived epidural analgesia as more effective with fewer side effects. Despite this, a significant proportion of patients experienced breakthrough pain, likely due to delays in follow-up, logistical issues, and inconsistent care practices. The results emphasize that effective pain management depends not only on the choice of analgesia but also on timely care, proper staffing, and coordinated clinical protocols to improve patient recovery and healthcare efficiency.

LIMITATIONS

In a single-center study, the findings may not be generalizable to other healthcare settings. The observational design limits the ability to establish causal relationships between analgesic modalities and outcomes. Variations in pain management practices, staff availability, and institutional protocols may have influenced the results. Additionally, subjective assessment of pain using the Numeric Rating Scale (NRS) may introduce reporting bias. Delays in follow-up, inconsistent implementation of analgesia protocols, and logistical constraints, such as medication availability, may also have affected patient outcomes. Furthermore, informal staff feedback regarding analgesic preferences was not systematically evaluated, which may limit the strength of such observations.

SUGGESTIONS / RECOMMENDATIONS

Based on the study findings, it is recommended to implement structured, multimodal pain management protocols tailored to the type of surgery, patient characteristics, and available institutional resources. Strengthening Acute Pain Services (APS) through standardized guidelines, regular staff training, and adequate resource allocation is essential. Increased utilization of regional techniques, particularly epidural analgesia, should be encouraged due to their effectiveness and lower side-effect profile, which may help reduce opioid dependence. Additionally, improving follow-up systems, minimizing delays in care delivery, and ensuring better coordination among healthcare providers can significantly enhance pain control and patient outcomes.

CONFLICT OF INTEREST / DISCLOSURE

The authors declare no conflict of interest.

FUNDING SOURCE

This study received no external funding.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the support of the staff and patients, for their cooperation during the study.

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