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Comparison of Intravenous Ibuprofen with Paracetamol for Post Operative Pain Management after Laparoscopic Cholecystectomy

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ABSTRACT

Background: Pain following laparoscopic cholecystectomy remains a frequent problem, although the procedure is considered minimally invasive. Pain experienced during the postoperative period is attributed to handling of tissues, pneumoperitoneum, irritation of the diaphragm, which may result in prolonged hospitalization, although early mobilization is fundamental for accelerated recovery. **Objective:** To compare mean post-operative pain scores between intravenous ibuprofen and paracetamol after laparoscopic cholecystectomy. **Study Design:** Randomized controlled trial. **Duration and Place of Study:** This study was conducted from June 2024 to December 2024 in the Department of Anesthesia, Lady Reading Hospital, Peshawar. **Methodology:** A total of 68 patients aged 20 to 60 years undergoing laparoscopic cholecystectomy were included. Patients were randomly divided into two equal groups. One group received intravenous ibuprofen 800 milligrams, while the other group received intravenous paracetamol 1000 milligrams. Pain was assessed at the twelfth postoperative hour using visual analog scale. Mean pain scores of both groups were compared using independent sample t test. A p value ≤ 0.05 was taken as statistically significant. **Results:** The mean age was 39.50 ± 7.77 years in the ibuprofen group and 40.94 ± 8.00 years in the paracetamol group. The mean pain score at twelve hours was 1.50 ± 0.13 in the intravenous ibuprofen group and 2.09 ± 0.18 in the intravenous paracetamol group. **Conclusion:** Intravenous ibuprofen provides better postoperative pain relief compared to intravenous paracetamol after laparoscopic cholecystectomy.

INTRODUCTION

Pain control following laparoscopic cholecystectomy represents a significant consideration within postoperative care due to the fact that despite it being a laparoscopic procedure and thus a form of minimal invasion on the body, there are moderate pain feelings because of handling, pneumoperitoneum, as well as irritation of the diaphragm.[1] Delayed mobility, inadequate effort with breathing, vomiting, as well as prolonged stay in hospital may occur in case of inadequate control.[2] Pain occurs at incisions and tips of the shoulder because of carbon dioxide.[3] It plays an essential role within early mobilization and alleviation. A strategy involving multiple analgesics and various combinations involving nonopioids with a focus on lowering opioid doses and side effects leads to significant consideration.[4] Ergonomics and safety within analgesics follow laparoscopic cholecystectomy.

IV Ibuprofen is an NSAID having anti-inflammatory properties. It is given for pain control in the post-operative period.[5] The mechanism of action involves inhibiting cyclooxygenase enzymes and thus suppressing prostaglandins, which contribute towards inflammation and pain.[6] Its advantage is that it acts quicker compared to oral ingestion.[6] It will reduce the intensity of pain and thus reduce the requirement for opioids, as it can lead to vomiting, nausea, and respiratory depression.[7] Ibuprofen can lead to several side effects like irritability of gastric mucosa, nephrotoxicity, and risk of haemorrhage.[8]

Paracetamol is commonly prescribed for pain control after operations due to its safety profile and efficacy against mild and moderate pain.[9] Paracetamol given intravenously works centrally and is thought to reduce prostaglandins within the central nervous system, but its mechanism largely remains unclear.[10] It can be commonly seen after laparoscopic cholecystectomy alone or with co-administration with analgesics. IV Paracetamol brings about rapid relief from pain and enhances patient satisfaction without any serious side effects related to gastrointestinal or renal functions.[11] Its analgesic effects will be relatively less compared with NSAIDs for controlling inflammation-associated pain.[12]

In one previous study the mean postoperative pain score (6^{th} hour) was 2.7 ± 1.69 in the paracetamol group compared to 1.5 ± 1.32 in the ibuprofen group. The mean

postoperative pain score (24th hour) was 1.7 ± 1.65 in the paracetamol group compared to 1.05 ± 1.32 in the ibuprofen group.[13] In the same study, the requirement of rescue analgesia (tramadol) was recorded in 75% of patients in the paracetamol group compared to 25% in the ibuprofen group.[13]

There are no local studies available on the efficacy of intravenous ibuprofen and paracetamol in Peshawar for the treatment of post operative pain associated with laparoscopic cholecystectomy. The patients and their perception regarding pain, as well as practices, might differ in Peshawar. The result of an ongoing research will assist researchers and medical practitioners in Peshawar in knowing which drug would be more effective and safer for treatment. Protocols can be designed based on research.

METHODOLOGY

This randomized controlled trial was carried out in the Anesthesia Department of Lady Reading Hospital, Peshawar, from June 2024 to December 2024. Ethical approval was taken from the ethical and research committee of Lady Reading Hospital before initiation of the study, and all research activities were conducted according to institutional ethical guidelines. The sample size was calculated as 68 patients with 34 patients allocated to each group by using mean post-operative pain score of 2.7 ± 1.69 in the ibuprofen group and 1.5 ± 1.32 in the paracetamol group[13] keeping confidence level at 95% and power of test at 90%.

Patients aged between 20 to 60 years of either gender undergoing laparoscopic cholecystectomy for chronic Cholecystitis of more than 3 months duration and belonging to ASA class 1 and 2 were included. Patients with history of intake of antiemetic or emetogenic drugs such as morphine or pethidine within last 24 hours, uremic patients with serum urea ≥ 65 mg/dl and patients with chronic diabetes mellitus of duration 3 years or more were excluded as these conditions were considered confounding factors and could introduce bias in study findings. Written informed consent was taken from all eligible patients before data collection, after explaining the purpose, procedure, and benefits of the study, and patients were assured regarding confidentiality and research use of data only.

All patients were randomly allocated into two groups by blocked randomization technique. Patients in group A received intravenous ibuprofen 800 mg diluted in 100 ml normal saline while patients in group B received intravenous paracetamol 1000 mg. Both drugs were administered by a single experienced anesthesiologist with minimum 5 years of experience once pneumoperitoneum was achieved at 14 mmHg, and infusion duration was kept at 30 minutes. All laparoscopic cholecystectomies were performed by a single experienced laparoscopic surgeon with minimum 5 years of experience. Patients were continuously monitored for surgery as per anesthetist guidelines. Hemostasis was ensured at surgical site before dressing at operating theater. All patients were monitored at 30-minute intervals till 12th postoperative hour and pain score measured at specified time. Pain scores in post-operative period were considered as end-points and compared for both groups at 12th postoperative hour. Pain measurement done on Visual Analog Scale, with scale 0 meant no pain and 10 meant worst pain, and done at 12th hour after laparoscopic cholecystectomy. Data was analyzed using SPSS version 20. Quantitative variables were presented as mean ± standard deviation. Categorical variables were presented as frequencies and percentages. Mean pain scores between both groups were compared using independent sample t test and p value ≤ 0.05 was taken as statistically significant.

RESULTS

The mean age was found to be 39.50 ± 7.77 years in intravenous ibuprofen group while it was 40.94 ± 8.00 years in intravenous paracetamol group. The height was recorded as 1.67 ± 0.06 m in both groups. The mean weight was 71.21 ± 8.35 kg in ibuprofen group and 72.94 ± 7.95 kg in paracetamol group. Body mass index was calculated as 25.53 ± 2.33 kg/m^2 in ibuprofen group whereas it was 26.07 ± 2.22 kg/m^2 in paracetamol group. Regarding gender distribution, males were 22 (64.7%) and females were 12 (35.3%) in both groups equally. In terms of residence, urban patients were 17 (50.0%) in ibuprofen group and 20 (58.8%) in paracetamol group, while rural patients were 17 (50.0%) in ibuprofen group and 14 (41.2%) in paracetamol group. The socioeconomic status showed that lower class patients were 17 (50.0%) in ibuprofen group and 14 (41.2%) in paracetamol group, and middle class patients were 17 (50.0%) in ibuprofen group and 20 (58.8%) in paracetamol group. Smoking status revealed that smokers were 10 (29.4%) in ibuprofen group and 17 (50.0%) in paracetamol group, while non-smokers were 24 (70.6%) in ibuprofen group and 17 (50.0%) in paracetamol group (as shown in Table-I).

Table I

Patient Demographics in both groups

Variables	Intravenous Ibuprofen	Intravenous Paracetamol
	n=34	n=34
	Mean ± SD	Mean ± SD
Age (years)	39.50 ± 7.77	40.94 ± 8.00
Height (m)	1.67 ± 0.06	1.67 ± 0.06
Weight (kg)	71.21 ± 8.35	72.94 ± 7.95
BMI (kg/m^2)	25.53 ± 2.33	26.07 ± 2.22
Gender	n (%)	n (%)
Male	22 (64.7%)	22 (64.7%)
Female	12 (35.3%)	12 (35.3%)
Residence		
Urban	17 (50.0%)	20 (58.8%)
Rural	17 (50.0%)	14 (41.2%)
Socioeconomic Status		
Lower	17 (50.0%)	14 (41.2%)
Middle	17 (50.0%)	20 (58.8%)
Smoking		
Yes	10 (29.4%)	17 (50.0%)
No	24 (70.6%)	17 (50.0%)

The comparison of pain score at 12 hours postoperatively between both groups demonstrated that mean pain score in intravenous ibuprofen group was 1.50±0.13 while in intravenous paracetamol group it was 2.09±0.18. The t value was calculated as -15.475 and the difference was found to be statistically highly significant with p value

<0.001, which indicates that intravenous ibuprofen was more effective in reducing postoperative pain as compared to intravenous paracetamol at 12 hours after laparoscopic cholecystectomy (as shown in Table-II).

Table II

Comparison of mean Pain Score at 12 hours in both groups

Outcome	Intravenous Ibuprofen n=34	Intravenous Paracetamol n=34	t value	P value
Pain Score at 12 hours	1.50±0.13	2.09±0.18	-15.475	<0.001

DISCUSSION

The demographic characteristics were comparable in both groups which ensure the reliability of comparison. The mean age was 39.50 ± 7.77 years in ibuprofen group and 40.94 ± 8.00 years in paracetamol group. Both groups had similar age distribution which eliminate the age-related confounding factors in pain perception because younger and older patients may have different pain thresholds and response to analgesics. The gender distribution was identical with 22 males (64.7%) and 12 females (35.3%) in each group. This equal gender representation is important because hormonal differences and pain tolerance vary between males and females which could affect the pain scores.

The most significant finding was pain score at 12 hours postoperatively which showed that intravenous ibuprofen group had mean pain score of 1.50±0.13 compared to 2.09±0.18 in paracetamol group with p value <0.001. This statistically significant difference demonstrate that ibuprofen provide superior pain relief than paracetamol. The mechanism behind this difference is that ibuprofen is non-steroidal anti-inflammatory drug which inhibit cyclooxygenase enzymes and reduce prostaglandin synthesis at peripheral and central level. This dual action provide more effective analgesia specially in inflammatory pain which is common after surgical procedures. On other hand, paracetamol work primarily through central mechanism and has weak anti-inflammatory properties which make it less effective in controlling postoperative pain where inflammatory component is significant.

The pain score at 12 hours was significantly lower in ibuprofen group (1.50±0.13) compared to paracetamol group (2.09±0.18) with p value <0.001. This finding is supported by Bulut *et al.* [14] who also studied laparoscopic cholecystectomy patients and reported VAS at 12 hours was 2 [0–4] with 800 mg IV ibuprofen versus 3 [0–5] with 1 g IV paracetamol (p < 0.001). Similarly, Tariq *et al.* [15] found that significant pain at 2 hours was present in 19% with 400 mg IV ibuprofen versus 35% with 1 g IV paracetamol (p < 0.001) and at 6 hours it was 13% versus 25% (p = 0.003) in same surgical procedure. The similarity in results can be explained by same surgical intervention that is laparoscopic cholecystectomy which produce similar inflammatory response and pain mechanisms. The superiority of ibuprofen is due to its potent anti-inflammatory action through inhibition of both COX-1 and COX-2 enzymes which reduce prostaglandin synthesis at surgical site.

However, Erdi *et al.* [16] reported different findings where they found no significant difference between ibuprofen and paracetamol groups in laparoscopic cholecystectomy with abdominal pain VAS at 24 hours being 3.02 ± 1.1 versus 2.89 ± 1.2 (p > 0.05). This contradiction could be explained by their use of fentanyl PCA in all groups which may have masked the difference between two drugs. Another possible reason is their higher dose of ibuprofen (800 mg) and different pain assessment timing. The demographic profile in present study showed mean age of 39.50 ± 7.77 years in ibuprofen group and 40.94 ± 8.00 years in paracetamol group which is comparable to Tariq *et al.* [15] who reported mean age 40 ± 8 years and Erdi *et al.* [16] who reported mean age 36–44 years. The gender distribution in present study was 22 males (64.7%) and 12 females (35.3%) in both groups which is different from previous studies where female predominance was observed like Tariq *et al.* [15] reported 73% females and Bulut *et al.* [14] reported 72% females. This difference in gender distribution is probably due to regional variation and sample selection criteria but it does not affect the primary outcome as both groups had identical gender distribution.

The findings are also supported by studies in other surgical procedures. Çalım *et al.* [17] in arthroscopic shoulder surgery found VAS at 24 hours was 2.0 [0–6] with 800 mg IV ibuprofen versus 2.5 [0–6] with 1 g IV paracetamol (p = 0.039) and Zaheer *et al.* [18] in pediatric tonsillectomy reported no pain at discharge in 70% with IV ibuprofen versus 36% with IV paracetamol (p < 0.001). These consistent results across different surgical procedures confirm that ibuprofen has better analgesic efficacy regardless of type of surgery. The Bayoumi *et al.* [19] systematic review of 110 randomized controlled trials also concluded that IV ibuprofen 400–800 mg reduced opioid consumption by 30–45% while IV paracetamol 1 g reduced it by only 15–25% after laparoscopic cholecystectomy which further support present study findings.

Despite the potential advantages of the two medications, this research has certain shortcomings which need to be recognized. The research is a single center trial that may not provide similar results when a different setting is considered. In addition, the sample size is small, with only 34 patients in each group, which might impact the power of the research. Third, the research considered the assessment of pain only at 12 hours postoperatively; hence, further follow-up periods were not considered to assess the longer-lasting analgesic effect of both medications. Fourth, the research did not assess the use of opioids as well as the use of rescue analgesic, which might have offered extra details concerning the efficacy of the two medications. Fifth, the side effects as well as the adverse effects were not recorded, which is significant while providing a comprehensive safety profile. Sixth, cost-effectiveness analysis was not considered, which is a significant factor while taking a decision regarding the use of medications. Lastly, a major limitation of this research might be that the population under consideration has a preponderance of males (64.7%) as compared to females (35.3%), which is not a common practice concerning cholecystectomy patients, as mostly the latter

predominate, and it might impact the applicability of research findings within the populace.

CONCLUSION

The current research has proven that intravenous ibuprofen is more efficacious when compared to intravenous paracetamol for the management of postoperative pain following a laparoscopic cholecystectomy procedure. The mean pain scores were significantly reduced in patients treated with intravenous ibuprofen than in patients treated with intravenous paracetamol at 12 hours post-procedure. The result is significant, thus proving that ibuprofen is more superior when used for pain relief in the postoperative period.

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REFERENCES

1. Lu, W., Yue, S., Xie, J., Li, Z., Wang, Y., Yang, Z., Hao, J., & Chen, W. (2025). Impact of Pneumoperitoneum pressure on post-cholecystectomy pain. *JSLS : Journal of the Society of Laparoscopic & Robotic Surgeons*, *29*(4), e2025.00082. https://doi.org/10.4293/jsls.2025.00082
2. Bergestuen, L., Hagen, M., & Kisa, S. (2025). Predictive clinical factors of pain-related quality of recovery following elective gastrointestinal and hepato-pancreato-Biliary surgery: An observational study in Norway. *Journal of Pain Research*, *18*, 47-59. https://doi.org/10.2147/jpr.s483665
3. Li, J., Zhao, H., Sheng, C., Liu, Y., & Zhan, R. (2025). Effect of controlled hyperventilation on post-laparoscopic cholecystectomy shoulder pain: A prospective randomized controlled trial. *Langenbeck's Archives of Surgery*, *410*(1). https://doi.org/10.1007/s00423-025-03666-z
4. Ghai, B., Jafra, A., Bhatia, N., Chanana, N., Bansal, D., & Mehta, V. (2022). Opioid sparing strategies for perioperative pain management other than regional anaesthesia: A narrative review. *Journal of Anaesthesiology Clinical Pharmacology*, *38*(1), 3-10. https://doi.org/10.4103/joacp.joacp_362_19
5. Zhou, P., Chen, L., Wang, E., He, L., Tian, S., & Zhai, S. (2023). Intravenous ibuprofen in postoperative pain and fever management in adults: A systematic review and meta-analysis of randomized controlled trials. https://doi.org/10.22541/au.168017949.92841320/v1
6. Maurice-Szamburski, A., Quemeneur, C., Rozier, R., Cuvillon, P., & Ecoffey, C. (2025). Intravenously administered nonsteroidal anti-inflammatory drugs in clinical practice: A narrative review. *Pharmacy*, *13*(1), 18. https://doi.org/10.3390/pharmacy13010018
7. Kim, S. H., Kang, H., Jun, I., Park, H. W., Yoo, B. H., Lim, Y., & Kim, K. (2024). Effect of perioperative intravenous ibuprofen versus acetaminophen on postoperative opioid consumption and pain after general anesthesia: A systematic review and meta-analysis with trial sequential analysis of randomized controlled trials. *Korean Journal of Anesthesiology*, *77*(4), 455-467. https://doi.org/10.4097/kja.24089
8. Tai, F. W., & McAlindon, M. E. (2021). Non-steroidal anti-inflammatory drugs and the gastrointestinal tract. *Clinical Medicine*, *21*(2), 131-134. https://doi.org/10.7861/clinmed.2021-0039
9. Ayoub, S. S. (2021). Paracetamol (acetaminophen): A familiar drug with an unexplained mechanism of action. *Temperature*, *8*(4), 351-371. https://doi.org/10.1080/23328940.2021.1886392
10. Lee, S., Koo, C., Bae, Y. K., & Ryu, J. (2025). Efficacy of intravenous acetaminophen as adjunct analgesia in patients undergoing cardiovascular surgery: A systematic review and meta-analysis. *The Korean Journal of Pain*, *38*(3), 320-331. https://doi.org/10.3344/kjp.25063
11. Lu, B., Tian, A., Fan, Z., Zhao, X., Jin, H., Ma, J., & Ma, X. (2025). Effectiveness of oral *vs* intravenous acetaminophen on pain management following total joint arthroplasty: A systematic review and meta-analysis. *World Journal of Orthopedics*, *16*(4). https://doi.org/10.5312/wjo.v16.i4.104452
12. Hopkins, S., Yang, V., & Liew, D. F. (2025). Choosing a nonsteroidal anti-inflammatory drug for pain. *Australian Prescriber*, *48*(4), 139-144. https://doi.org/10.18773/austprescr.2025.032
13. DEMİROLUK, Ö., ABİTAĞAOĞLU, S., KARACA GÖÇMEN, D., ÖZCABI, Y., & ERDOĞAN ARI, D. (2019). Comparison of analgesic effects of paracetamol and ibuprofen after Laparoscopic cholecystectomy. *Turkiye Klinikleri Journal of Medical Sciences*, *39*(3), 278-284. https://doi.org/10.5336/medsci.2018-63679
14. Bulut A, Bayburt FA, Tamdogan İ. (2025). The efficacy of ibuprofen for postoperative pain following Laparoscopic cholecystectomy: A randomised controlled study. (2025). Journal of the College of Physicians and Surgeons Pakistan, 35(11), 1368-1373. https://doi.org/10.29271/jcpsp.2025.11.1368
15. Tariq, W., Sarfaraz, A., Rafique, A., Sultan khan, M. A., Tariq, H. B., & Buland, K. (2025). Comparison of Intraoperative intravenous ibuprofen versus intravenous paracetamol for post-operative pain relief in patients undergoing Laparoscopic cholecystectomy. *Pakistan Armed Forces Medical Journal*, *75*(3), 514-518. https://doi.org/10.51253/pafmj.v75i3.7872
16. Erdi, A. M., Arabzadeh, A., IssazadehFar, K., Masoumzadeh, M., & Bahadoram, M. (2022). Comparing the efficacy and side effects of intravenous ibuprofen and acetaminophen in pain control following Laparoscopic cholecystectomy. *WORLD JOURNAL OF PLASTIC SURGERY*, *11*(1), 117-124.

https://doi.org/10.52547/wjps.11.1.117
17. CALIM, M., YESILTAS, S., GUNAY, M., SUMER, I., & AKBAS, S. (2023). Efficacy of intravenous ibuprofen and paracetamol on postoperative pain and Tramadol consumption after Arthroscopic shoulder surgery: A prospective, randomized, double-blind clinical trial. *Medeniyet Medical Journal*, *38*(3), 210-217. https://doi.org/10.4274/mmj.galenos.2023.99975
18. Zaheer, A., Majeed, K., Sharif, A., Bashir, S., Khan, A., & Niwaz, A. (2023). Comparison of intravenous ibuprofen and paracetamol for Peri-operative analgesia in paediatric day care tonsillectomy: Research article. *Journal of the Pakistan Medical Association*, *74*(1), 58-61. https://doi.org/10.47391/jpma.8155
19. Bayoumi, H. M., Abdelaziz, D. H., El Said, N. O., Boraii, S., & Bendas, E. R. (2024). Postoperative pain management following laparoscopic cholecystectomy-non-opioid approaches: A review. *Future Journal of Pharmaceutical Sciences*, *10*(1). https://doi.org/10.1186/s43094-024-00697-z