

The absence of a significant difference in NRS pain scores between the two groups indicates that both ibuprofen-paracetamol and ketorolac-paracetamol combinations provide comparable analgesia in this patient population. This finding supports the concept of multimodal analgesia, where combining drugs with different mechanisms can provide effective pain relief even though intravenous ketorolac is typically viewed as more potent than oral ibuprofen. The efficacy of paracetamol as a foundational component in both regimens likely contributed to these outcomes, given its well-established analgesic properties in postoperative pain management [2].

An important aspect of this study is the evaluation of the coagulation profile. Although both combinations provided equivalent analgesia, significant differences were observed in the coagulation profile and IL-6 levels. The ketorolac-paracetamol group exhibited a significant prolongation of BT at 24 and 48 hours postoperatively. Ketorolac is known to cause prolonged BT and reduced platelet aggregation [12, 13]. By contrast, paracetamol exerts minimal effects on platelet aggregation and does not significantly prolong BT [14]. Ibuprofen, although classified as an NSAID, has been reported to have effects on platelet aggregation and coagulation that return to normal within 24 hours after the last dose [15, 16]. The increased BT observed in the ketorolac-paracetamol group indicates a potentially higher risk of bleeding compared to the ibuprofen-paracetamol group, particularly in surgical procedures requiring meticulous hemostatic control.

Furthermore, this study also examined the effects on serum IL-6 levels, an important inflammatory marker. The ibuprofen-paracetamol group demonstrated a more significant reduction in serum IL-6 levels at 6 and 24 hours postoperatively compared to the ketorolac-paracetamol group. IL-6 is a pro-inflammatory cytokine released in response to tissue injury and surgical stress [17], and it correlates with systemic inflammatory response and pain intensity [18]. Other studies have reported that ibuprofen, prednisone, and betamethasone are equally effective in reducing IL-6 levels when compared with indomethacin and piroxicam. Research comparing the effects of diclofenac, ketorolac, and tramadol has shown that all three drugs are capable of reducing IL-6 production in response to surgical trauma [19, 20]. The greater suppression of IL-6 by the ibuprofen-paracetamol combination may reflect the stronger anti-inflammatory effects of ibuprofen compared to ketorolac. This suggests that ibuprofen may be more effective in modulating the systemic inflammatory response following surgery.

Such a mechanism could contribute to improved patient recovery, although further investigation is warranted.

The strengths of this study include a double-blind randomized clinical trial design, which helps minimize bias. Objective measurements, such as coagulation parameters and IL-6 levels, further enhance the robustness of the data. However, several limitations should be noted. A limitation of this study is the follow-up period restricted to 48 hours postoperatively. This short observation window limits the ability to assess potential long-term adverse effects associated with the administration of ibuprofen-paracetamol and ketorolac-paracetamol combinations. Therefore, further studies with extended follow-up periods are necessary to comprehensively evaluate the safety profiles of these analgesic regimens.

The findings of this study support that the combination of ibuprofen-paracetamol offers analgesic efficacy equivalent to that of ketorolac-paracetamol in gynecological patients, with a more favorable coagulation profile. This suggests that ibuprofen-paracetamol may represent a safer analgesic option, particularly for patients at risk of bleeding or those undergoing procedures with a high risk for bleeding. In addition, it also has a better anti-inflammatory effect.

Future research should include longer follow-up durations to evaluate the long-term impact on morbidity related to bleeding and chronic pain. Broader investigations of inflammatory markers and more comprehensive assessments of platelet function would also provide deeper insights into the mechanisms of action of these drug combinations. In addition, studies assessing the cost-effectiveness and patient satisfaction of both regimens would be highly valuable.

Conclusion

The combinations of ibuprofen-paracetamol and ketorolac-paracetamol demonstrated a comparable efficacy in managing postoperative pain in gynecological patients. The ibuprofen-paracetamol combination did not significantly affect CT and BT, whereas the ketorolac-paracetamol combination significantly influenced coagulation profiles, specifically BT, at 24 and 48 hours post-surgery. The ibuprofen-paracetamol combination resulted in lower IL-6 levels at 6 and 24 hours postoperatively compared to the ketorolac-paracetamol combination, showing that it was more effective in suppressing the inflammatory response. The choice of an analgesic regimen should carefully balance pain control efficacy, coagulation safety profile, and the need to modulate the inflammatory response on an individual patient basis.

AUTHORS' STATEMENT: AI Use Statement: We, the authors of this article, hereby declare that whatever is contained in this article is purely the result of research that we have conducted, not solely from AI. **Originality statement:** Parts of this study have never been published or presented at any congress or scientific meeting. **Conflict of interest:** We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property. We further confirm that any aspect of the work covered in this manuscript that has involved either experimental human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript. We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He is responsible for communicating with the other authors about progress, submissions of