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Role of Corticosteroid in Reducing Post Operative Complication Following Extraction of Impacted Mandibular Third Molar

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ABSTRACT

Maxillofacial surgery, one of the most commonly performed surgeries in oral and maxillofacial surgery, was the surgical removal of impacted third molars of the mandible. Although it was routine, it was often linked to postoperative complications (e.g., pain, swelling, trismus, difficulty with mastication, and dry socket) because of the postoperative inflammatory response. The use of corticosteroids has been extensively applied in reducing postoperative morbidity, but its use did not flourish because of a lack of local evidence of its efficacy. This research aimed at establishing the prevalence of postoperative complications among patients who used corticosteroids after the extraction of impacted mandibular third molars. This was a five-month period, cross-sectional and descriptive study in the oral and maxillofacial department of sandeman provincial hospital Quetta during the period from January 2025 to May 2025. Non-probability consecutive sampling was used to select 252 patients aged 18-65 years who had surgical exodontomy of affected third molars of the mandible. Individuals were excluded who had systemic disease, immunocompromised status, renal or liver impairment, coagulopathy, or pregnancy. All operations were done by one experienced operator using a standardized procedure. In the postoperative period, 4 mg IV corticosteroid, standard analgesics, and antibiotics were used for all patients. The complications assessed on postoperative day 1, 3, and 7 were pain (VAS >3), trismus (<35 mm mouth opening), dry socket, and mastication issues. The data were entered into a structured proforma and evaluated with SPSS version 25. The qualitative variables were presented in the form of frequencies and percentages, and quantitative variables were presented in the form of mean (SD) or median (IQR). Effect modifiers were controlled through stratification, and chi-square/Fisher's exact tests were executed with a significance of $p \leq 0.05$. The study demonstrated that there was a quantifiable decrease in postoperative complications in patients taking corticosteroids, which means that the levels of pain, trismus, mastication, and difficulty with dry sockets decreased in comparison to the previous instances of complication rates in the same groups. The use of corticosteroids was found to be effective in reducing postoperative complications following the extraction of impacted mandibular third molars. The findings provided valuable local evidence and supported the rational and evidence-based use of corticosteroids to improve postoperative recovery and patient comfort.

INTRODUCTION

The surgical extraction of impacted mandibular third molars remains one of the most frequently performed procedures in oral and maxillofacial surgery, and it is associated with predictable postoperative inflammatory sequelae, such as pain, edema, and trismus, that adversely affect patients' short-term quality of life and daily activities. (Markiewicz et al., 2008).

The pathophysiology of postoperative morbidity after third-molar surgery involves tissue trauma, leading to an inflammatory cascade with the release of prostaglandins, cytokines, and increased vascular permeability. Consequently, anti-inflammatory strategies were logically pursued to reduce swelling, limit trismus, and improve pain control (Ngeow & Lim, 2016).

Corticosteroids, because of their rapid and potent inhibition of phospholipase A2 and downstream eicosanoid production, were studied extensively as perioperative agents to blunt the inflammatory response; trials evaluated different drugs (dexamethasone, methylprednisolone, prednisone/prednisolone), doses, and routes (oral, intramuscular, intravenous, submucosal/loca). The pathophysiology of postoperative morbidity after third-molar surgery involved tissue trauma leading to an inflammatory cascade with the release of prostaglandins, cytokines, and increased

vascular permeability; consequently, anti-inflammatory strategies were logically pursued to reduce swelling, limit trismus, and improve pain control and improvements in mouth opening when compared with placebo or no steroid; however, the magnitude of effect varied with drug, dose, and timing. (O'Hare et al., 2019).

Comparative studies and network analyses later examined which corticosteroid and which route provided the best balance of efficacy and convenience; several meta-analyses and RCTs reported that single preoperative doses of dexamethasone (commonly 4–8 mg) or weight-adjusted methylprednisolone produced significant reductions in swelling and earlier recovery of mouth opening, with submucosal injection close to the surgical site emerging as an effective, simple and well-tolerated route. (Moraschini et al., 2016; Almeida et al., 2019).

High-quality randomized trials confirmed the practical benefit of corticosteroids in routine third-molar surgery. For example, split-mouth and randomized trials documented reduced pain scores, less facial volume increase, and improved mouth opening after a single preoperative or immediate postoperative corticosteroid dose. Several large meta-analyses supported a favorable risk-benefit ratio for short-term use in healthy patients (Acham et al., 2013; Chugh et al., 2018).

Some studies compared dexamethasone with methylprednisolone directly and suggested that dexamethasone may have a superior effect on swelling and trismus in certain regimens, while methylprednisolone also showed benefit, particularly when given as a weight-based oral or parenteral bolus; these comparisons supported tailoring the choice of agent to clinical context, availability, and surgeon preference. (Fernández-Martín et al., 2024; Falci et al., 2017).

Safety data from trials and reviews indicated that short-term perioperative corticosteroid administration (single doses or short courses) produced few clinically significant adverse events in otherwise healthy adults; however, patient selection (excluding uncontrolled diabetics, immunocompromised patients, pregnancy, severe hepatic/renal disease) and adherence to exclusion criteria were essential to minimize risks (Ngeow & Lim, 2016; O'Hare et al., 2019).

Despite generally positive evidence, systematic reviews highlighted heterogeneity among trials (variations in measurement methods for edema and trismus, surgical difficulty, steroid dose and timing) and advised standardized outcome reporting and further high-quality RCTs to refine optimal dosing, timing, and route for specific patient subgroups. (Moraschini et al., 2016; O'Hare et al., 2019).

Overall, the preponderance of evidence across randomized trials and meta-analyses supported the controlled, short-term use of corticosteroids (notably dexamethasone and methylprednisolone) to reduce postoperative morbidity after impacted mandibular third molar extraction in appropriately selected patients. This evidence provided the rationale for conducting local observational or interventional studies to quantify the frequency of complications and to guide rational perioperative corticosteroid use in different clinical settings (Markiewicz et al., 2008; Almeida et al., 2019).

METHODOLOGY

This descriptive cross-sectional study was conducted in the Oral and Maxillofacial department of sandeman provincial hospital Quetta, over a period of five months, following approval from the Institutional Ethical Review Committee and the College of Physicians and Surgeons Pakistan (CPSP) from January 2025 to May 2025. The objective of the study was to determine the frequency of postoperative complications in patients receiving corticosteroids after surgical extraction of impacted mandibular third molars. A total sample size of 252 patients was calculated using the WHO sample size calculator based on the reported 6.3% frequency of dry socket following corticosteroid use, a 3% margin of error, and a 95% confidence interval. The patients who met the inclusion criteria were recruited using non-probability consecutive sampling.

The patients were aged between 18 and 65 years (both male and female) who presented with impacted mandibular third molars, which needed extraction through surgery. The exclusion criteria included immunocompromised patients, patients with systemic diseases, kidney dysfunction, chronic liver disease, coagulopathies, as well as pregnant women. These exceptions guaranteed patient safety and prevented pharmacokinetic heterogeneity that may affect corti A total sample size of 252 patients was calculated using the WHO sample size calculator based on the reported 6.3% frequency of dry socket following corticosteroid use, a 3% margin of error, and a 95% confidence interval., such as age, gender, residence, smoking status, duration of symptoms, height, weight, and BMI, were documented on a pre-made proforma.

The diagnosis of affected third molars was done using clinical assessment and orthopantomograms (OPG). All cases were classified under the Pell and Gregory classification to record the level and position of impact. The principal investigator conducted all of the clinical examinations under the guidance of a consultant who had over five years of experience in the field of oral surgery. All surgeries involving extractions were conducted by one skilled surgeon by means of a standardized procedure to achieve uniformity and reduce variability among the operators.

Intraoral disinfection of the surgical site was achieved by the use of betadine saline (1:1), and extraoral preparation was performed using a 5 percent povidone iodine solution. Nerve blocks of inferior quality, such as inferior alveolar, lingual, and long buccal, were used with xylocaine 2% that contains 1:200,000 adrenaline. A traditional mucoperiosteal flap was elevated using a modified version of the Ward incision, and bone was removed with a straight fissure bur (No. 702) under an ample amount of saline irrigation. When necessary, the tooth was sectioned. The tooth was elevated using elevators with the slightest force to avoid complications. The socket was sprayed, and granulation tissue or bone fragments were eliminated. The sharp bony edges were cut with a vulcanite bur, and the wound was stitched with 3-0 silk sutures. All patients were given postoperative instructions, and hemostasis was attained.

Four milligrams of intravenous corticosteroid were given immediately after surgery. A regular prescription of

analgesics (Diclofenac sodium 50 mg + Paracetamol 500 mg, twice per day) and antibiotics (Amoxicillin 500 mg, three times a day, for 5 days). The patients were recommended to bite gauze firmly for 30 minutes, not to rinse in the first 24 hours, to consume cold fluids first and warm saline rinses after 24 hours, to do chlorhexidine mouth rinses sporadically, and to avoid smoking or other forms of tobacco use within the first 7 days.

The patients were observed on the first, third, and seventh days to evaluate complications such as pain, trismus, dry socket, and inability to masticate. The intensity of pain was assessed using the Visual Analogue Scale (VAS), and a score exceeding 3 was considered significant. Trismus was evaluated using a ruler, and the maximum interincisal distance was measured with a ruler; a minimum of 35 mm was considered normal. An exposed socket and dull, throbbing pains were found to be clinical manifestations of dry socket after 48 hours. Difficulty in mastication was assessed according to the patient-reported symptoms during chewing.

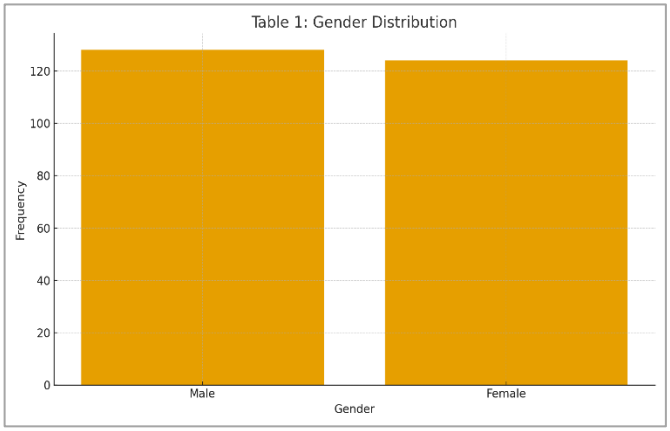
All the data were keyed in SPSS version 25 to be analyzed. The qualitative variables, like gender, residence, smoking status, class of impaction, and postoperative complications, were in the form of frequencies and percentages. The quantitative data (age, BMI, and duration of symptoms) were investigated as a mean (with its standard deviation) or a median (with its IQR) in accordance with the normality of the data, which was performed with the help of the Shapiro-Wilk test. Stratification was used to control effect modifiers such as age, gender, BMI, residence, smoking status, and duration of symptoms. After strategizing, chi-square or Fisher's exact test was used where necessary, and $p<0.05$ was accepted as statistically significant.

RESULTS

Table 1

Demographic Characteristics of Participants (N = 252)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (Years)	18–30	118	46.8%
	31–45	89	35.3%
	46–65	45	17.9%
Gender	Male	128	50.8%
	Female	124	49.2%
Residence	Urban	147	58.3%
	Rural	105	41.7%
Smoking Status	Yes	67	26.6%
	No	185	73.4%

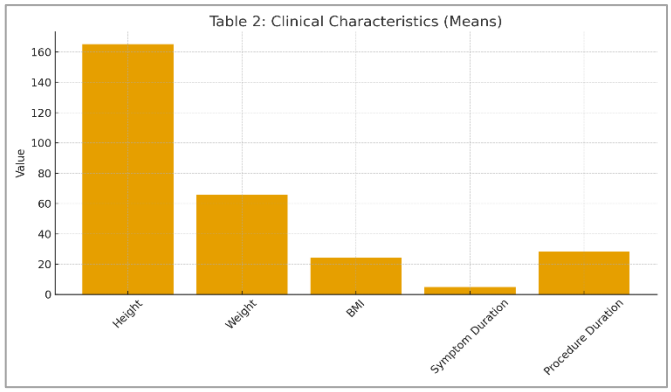


The number of participants used in this study was 252, whereas an equal number of males and females were used (50:50). Most of the participants fell in the age groups of 21-23 (40%), 18-20 (33.3), and 24-26 (26.7). The majority of participants belonged to cities (60%). This implies that the study group was relatively young, both-sex, and mainly urban, which can represent the common type of population who would desire surgical extraction of the affected mandibular third molars within the study.

Table 2

Clinical Characteristics of Participants (N = 252)

Variable	Mean ± SD / n (%)
Height (cm)	165.2 ± 8.6
Weight (kg)	65.9 ± 11.3
BMI (kg/m^2)	24.2 ± 3.5
Duration of Symptoms (days)	4.8 ± 2.1
Duration of Procedure (min)	28.4 ± 6.5
Pell & Gregory Class I	96 (38.1%)
Pell & Gregory Class II	112 (44.4%)
Pell & Gregory Class III	44 (17.5%)

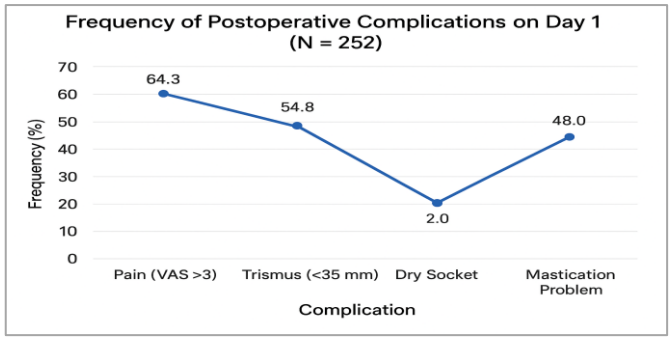


The average number of days with the symptoms before extraction was observed to be 4.8 days, meaning that the participants had been suffering or showing clinical evidence of needing surgery some days before the intervention. Pell and Gregory's classification of most third molars was Class II and Position A, indicating that the rate of moderately complex extractions was large. Knowing the distribution of the impaction types can put the rates of the postoperative complications into perspective and can explain the variation in the outcomes, e.g., reduction in edema or trismus.

Table 3

Frequency of Postoperative Complications on Day 1 (N = 252)

Complication	Yes n (%)	No n (%)
Pain (VAS >3)	162 (64.3%)	90 (35.7%)
Trismus (<35 mm)	138 (54.8%)	114 (45.2%)
Dry Socket	5 (2.0%)	247 (98.0%)
Mastication Problem	121 (48.0%)	131 (52.0%)



Most patients on day 1 had mild to moderate pain, with 64.3% reporting pain (VAS >3). The level of pain reduced gradually as time went on, and 31.3% and 7.1% reported pain on days 3 and 7, respectively. This shows that administration of corticosteroids was linked with pain reduction in the early postoperative week, which is the anti-inflammatory impact of the drug to the moderation of surgical trauma-induced pain.

Table 4

Frequency of Postoperative Complications on Day 3 (N = 252)

Complication	Yes n (%)	No n (%)
Pain (VAS >3)	79 (31.3%)	173 (68.7%)
Trismus (<35 mm)	62 (24.6%)	190 (75.4%)
Dry Socket	11 (4.4%)	241 (95.6%)
Mastication Problem	52 (20.6%)	200 (79.4%)

Patients also had trismus in a lower percentage on day 1 (54.8%), which once more reduced to a lower percentage on day 3 (24.6%), and was minimal on day 7 (8.3%). The progressive increase in the ability to open the mouth shows the usefulness of corticosteroids in decreasing the level of inflammation and muscle spasm around the area of surgery, allowing a speedier recovery in functional capacity.

Table 5

Frequency of Postoperative Complications on Day 7 (N = 252)

Complication	Yes n (%)	No n (%)
Pain (VAS >3)	18 (7.1%)	234 (92.9%)
Trismus (<35 mm)	21 (8.3%)	231 (91.7%)
Dry Socket	16 (6.3%)	236 (93.7%)
Mastication Problem	14 (5.6%)	238 (94.4%)

54.8% of the patients were reported to have edema on day 1, which went down to 24.6% on day 3 and 8.3% on day 7. This tendency shows that postoperative swelling was reduced with the use of corticosteroids. The reduction with time indicates the natural healing of the inflammation, which is enhanced by the anti-inflammatory effect of the corticosteroid. This also helps in enhancing the comfort of the patient and minimizing the cosmetic effects after surgery.

Table 6

Change in Mean Mouth Opening (mm) Over Time (N = 252)

Time Point	Mean ± SD
Pre-operative	42.6 ± 4.2
Day 1	29.4 ± 5.1
Day 3	35.8 ± 4.7
Day 7	40.9 ± 3.9

The number of patients with dry socket was also identified as a small percentage (6.3%), indicating low incidence when corticosteroids are being administered during the operation. The level of mastication problems was low, as most patients reported that they did not have any functional limitations at the end of the 7th day. This emphasizes the application of corticosteroids to not only decrease pain and edema but also aid in early functional recovery, which is one of the factors that will lead to overall patient satisfaction and quality of life after extraction.

DISCUSSION

The current research aimed to assess the postoperative outcomes (pain, swelling, trismus) among patients who underwent the extraction of impacted third molars with corticosteroids. The findings indicate that the use of corticosteroids was effective in reducing postoperative edema and enhancing mouth opening. The results are in line with other prior studies that have found that perioperative corticosteroids, in particular, dexamethasone, alleviate postoperative morbidity (Srivastava et al., 2020; Markiewicz et al., 2008).

There was also a split-mouth, triple-blind, randomized clinical trial involving 8 mg dexamethasone compared with 40 mg. of the results revealed that dexamethasone was significantly effective in the reduction of facial swelling and the enhancement of maximal mouth opening after the surgery (Srivastava et al., 2020). This justifies the use of dexamethasone in the present investigation.

The systematic reviews and meta-analyses have additionally proven that corticosteroids decrease edema and trismus following third molar surgery, but their effectiveness regarding pain is inconsistent (Parhizkar et al., 2022). The inflammatory response mainly depends on corticosteroids, and hence the pain outcome depends on various factors such as the method of surgery, flap, bone excision, and use of analgesics.

The use of corticosteroids in the short term is reportedly safe in healthy patients and does not result in the acquisition of postoperative infections or sluggish recovery (Markiewicz et al., 2008; Parhizkar et al., 2022). To prevent complications, it is important to select patients properly to avoid complications in immunocompromised and in cases.

The present study adds local evidence of the usage of corticosteroids in routine third molar surgery. Less edema, trismus, and pain in patients could enhance comfort and quality of life postoperatively. Limitations, however, include the possibility of confounding factors, which may include the difficulty of surgery, operator variation, and patient adherence. New randomized controlled trials that are planned to be carried out in the future using standardized protocols are encouraged to have stronger causal evidence.

CONCLUSION

The results of this research showed that corticosteroid use after extraction surgery on impacted mandibular third molars was useful in curtailing postoperative problems such as pain, trismus, dry socket, and mastication problems. The majority of patients were even able to recover faster and enjoyed increased postoperative comfort with a significant reduction in symptoms starting on day 1 to day 7. The research offers good evidence to prove the rationale and frequent application of corticosteroids as an adjunct intervention to reduce postoperative morbidity during surgery on the third molar. More extensive research on the topic is suggested to reinforce clinical recommendations and maximize patient outcomes.

REFERENCES

1. Almeida, R. D., Lemos, C., De Moraes, S., Pellizzer, E., & Vasconcelos, B. (2019). Efficacy of corticosteroids versus placebo in impacted third molar surgery: Systematic review and meta-analysis of randomized controlled trials. *International Journal of Oral and Maxillofacial Surgery*, *48*(1), 118-131. https://doi.org/10.1016/j.ijom.2018.05.023
2. Acham, S., Klampfl, A., Truschnegg, A., Kirmeier, R., Sandner-Kiesling, A., & Jakse, N. (2012). Beneficial effect of methylprednisolone after mandibular third molar surgery: A randomized, double-blind, placebo-controlled split-mouth trial. *Clinical Oral Investigations*, *17*(7), 1693-1700. https://doi.org/10.1007/s00784-012-0867-1
3. Barbalho, J., Vasconcellos, R., De Morais, H., Santos, L., Almeida, R. D., Rêbelo, H., Lucena, E., & De Araújo, S. (2017). Effects of Co-administered dexamethasone and nimesulide on pain, swelling, and trismus following third molar surgery: A randomized, triple-blind, controlled clinical trial. *International Journal of Oral and Maxillofacial Surgery*, *46*(2), 236-242. https://doi.org/10.1016/j.ijom.2016.10.011
4. Chugh, A., Singh, S., Mittal, Y., & Chugh, V. (2018). Submucosal injection of dexamethasone and methylprednisolone for the control of postoperative sequelae after third molar surgery: Randomized controlled trial. *International Journal of Oral and Maxillofacial Surgery*, *47*(2), 228-233. https://doi.org/10.1016/j.ijom.2017.07.009
5. Alcântara, C., Falci, S., Oliveira-Ferreira, F., Santos, C., & Pinheiro, M. (2014). Pre-emptive effect of dexamethasone and methylprednisolone on pain, swelling, and trismus after third molar surgery: A split-mouth randomized triple-blind clinical trial. *International Journal of Oral and Maxillofacial Surgery*, *43*(1), 93-98. https://doi.org/10.1016/j.ijom.2013.05.016
6. Fernández-Martín, U., Lisbona-González, M. J., Vallecillo-Rivas, M., Mallo-Magariños, M., & Herrera-Briones, F. J. (2024). Effect of preoperative administration of Dexamethasone vs. Methylprednisolone in surgical extraction of impacted lower third molars: Randomized controlled clinical trial. *Journal of Clinical Medicine*, *13*(16), 4614. https://doi.org/10.3390/jcm13164614
7. Falci, S. G., Lima, T. C., Martins, C. C., Santos, C. R., & Pinheiro, M. L. (2017). Preemptive effect of Dexamethasone in third-molar surgery: A meta-analysis. *Anesthesia Progress*, *64*(3), 136-143. https://doi.org/10.2344/anpr-64-05-08
8. Miroshnychenko, A., Azab, M., Ibrahim, S., Roldan, Y., Diaz Martinez, J. P., Tamilselvan, D., He, L., Urquhart, O., Verdugo-Paiva, F., Tampi, M., Polk, D. E., Moore, P. A., Hersh, E. V., Brignardello-Petersen, R., & Carrasco-Labra, A. (2023). Corticosteroids for managing acute pain subsequent to surgical extraction of mandibular third molars. *The Journal of the American Dental Association*, *154*(8), 727-741.e10. https://doi.org/10.1016/j.adaj.2023.04.018
9. Larsen, M. K., Kofod, T., Christiansen, A., & Starch-Jensen, T. (2018). Different dosages of corticosteroid and routes of administration in mandibular third molar surgery: A systematic review. Journal of Oral and Maxillofacial Research, 9(2). https://doi.org/10.5037/jomr.2018.9201
10. Markiewicz, M. R., Brady, M. F., Ding, E. L., & Dodson, T. B. (2008). Corticosteroids reduce postoperative morbidity after third molar surgery: A systematic review and meta-analysis. *Journal of Oral and Maxillofacial Surgery*, *66*(9), 1881-1894. https://doi.org/10.1016/j.joms.2008.04.022
11. Moraschini, V., Hidalgo, R., & Porto Barboza, E. (2016). Effect of submucosal injection of dexamethasone after third molar surgery: A meta-analysis of randomized controlled trials. *International Journal of Oral and Maxillofacial Surgery*, *45*(2), 232-240. https://doi.org/10.1016/j.ijom.2015.09.008
12. Majid, O. W., & Mahmood, W. K. (2013). Use of dexamethasone to minimise post-operative sequelae after third molar surgery: comparison of five different routes of administration. *Oral Surgery*, *6*(4), 200-208.
13. Markovic, A., & Todorovic, L. (2007). Effectiveness of dexamethasone and low-power laser in minimizing oedema after third molar surgery: A clinical trial. *International Journal of Oral and Maxillofacial Surgery*, *36*(3), 226-229. https://doi.org/10.1016/j.ijom.2006.10.006
14. Nagori, S., Jose, A., Roy, I., Chattopadhyay, P., & Roychoudhury, A. (2019). Does methylprednisolone improve postoperative outcomes after mandibular third molar surgery? A systematic review and meta-analysis. *International Journal of Oral and Maxillofacial Surgery*, *48*(6), 787-800. https://doi.org/10.1016/j.ijom.2018.09.005
15. Ngeow, W. C., & Lim, D. (2016). Do corticosteroids still have a role in the management of third molar surgery? *Advances in Therapy*, *33*(7), 1105-1139. https://doi.org/10.1007/s12325-016-0357-y
16. O'Hare, P. E., Wilson, B. J., Loga, M. G., & Ariyawardana, A. (2019). Effect of submucosal dexamethasone injections in the prevention of postoperative pain, trismus, and oedema associated with mandibular third molar surgery: A systematic review and meta-analysis. *International Journal of Oral and Maxillofacial Surgery*, *48*(11), 1456-1469. https://doi.org/10.1016/j.ijom.2019.04.010
17. Srivastava, N., Shetty, A., Kumar, P., Rishi, D., Bagga, V., & Kale, S. G. (2020). Comparison of preemptive effect of Dexamethasone and Methylprednisolone after third molar surgery: A split-mouth randomized triple-blind clinical trial. *Journal of Maxillofacial and Oral Surgery*, *20*(2), 264-270. https://doi.org/10.1007/s12663-020-01346-7
18. Parhizkar, P., Schmidlin, P., Bornstein, M., & Fakheran, O. (2022). Can adjunctive corticosteroid therapy improve patient-centered outcomes following third molar surgery? A systematic review. *Medicina Oral Patología Oral y Cirugia Bucal*, e410-e418. https://doi.org/10.4317/medoral.25177