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ASSESSMENT OF POSTOPERATIVE MORBIDITY IN ORAL SURGERY PATIENTS RECEIVING CORTICOSTEROIDS VERSUS NO CORTICOSTEROID THERAPY

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ABSTRACT

Background: Postoperative pain, facial oedema, and trismus are common sequelae of oral surgical procedures that may adversely affect patient recovery and quality of life. Corticosteroids have been widely advocated for their anti-inflammatory properties; however, evidence regarding their routine perioperative use remains variable across different oral surgical settings.

Aim: To compare postoperative morbidity in patients undergoing elective oral surgical procedures with and without perioperative corticosteroid therapy

Materials and Methods: A randomized controlled trial was conducted between April 2025 and March 2026 at two oral and maxillofacial surgery units. Ninety patients aged 18–45 years undergoing elective oral surgical procedures were randomly allocated to receive either intravenous dexamethasone (8 mg) administered 30 minutes preoperatively (corticosteroid group; n = 45) or no corticosteroid therapy (control group; n = 45). Primary outcome measures included facial oedema, pain intensity assessed using the Visual Analog Scale (VAS), and mouth opening. Secondary outcomes included analgesic consumption, quality of life, return to a normal diet, and postoperative adverse events. Outcome assessments were performed at baseline and at 24 hours, 72 hours, and 7 days postoperatively. Statistical analysis was performed using mixed-model repeated-measures Analysis of Covariance (ANCOVA), independent-samples *t*-tests, and chi-square tests, with statistical significance set at $p < 0.05$.

Results: Of the 90 enrolled participants, approximately 97% completed the follow-up protocol. Baseline demographic and clinical characteristics were comparable between groups. At 72 hours postoperatively, the corticosteroid group demonstrated significantly lower facial oedema (6.8 ± 2.1 mm vs. 11.6 ± 3.4 mm; $p < 0.001$), lower pain scores (VAS: 2.4 ± 0.9 vs. 4.2 ± 1.2; $p < 0.001$), and greater mouth opening (44.6 ± 4.8 mm vs. 38.3 ± 5.2 mm; $p < 0.001$) than the control group. Analgesic consumption during the first 72 hours was significantly reduced in the corticosteroid group (3.2 ± 1.1 vs. 5.1 ± 1.4 tablets; $p < 0.001$). Patients receiving corticosteroids also exhibited superior quality-of-life scores (78.4 ± 7.6 vs. 65.3 ± 9.1; $p < 0.001$) and returned to a normal diet earlier (3.1 ± 0.9 vs. 4.8 ± 1.2 days; $p < 0.001$). Wound infection and alveolar osteitis occurred less frequently in the corticosteroid group, whereas mild transient hyperglycaemia (4.4%) and gastrointestinal discomfort (6.7%) were observed only among corticosteroid recipients. No serious adverse events were reported.

Conclusion: Perioperative administration of intravenous dexamethasone significantly reduced postoperative morbidity following elective oral surgical procedures by decreasing facial oedema, pain, trismus, and analgesic requirements while improving quality of life and accelerating functional recovery. The therapy was well tolerated, with only minor transient adverse effects and no serious complications. These findings support the judicious use of perioperative corticosteroids as an effective adjunct in the management of postoperative morbidity in oral surgery.

KEYWORDS: Corticosteroid therapy, Facial oedema, Oral surgery, Pain management, Post-operative morbidity, Trismus

INTRODUCTION

Post-operative morbidity following oral and maxillofacial surgical procedures constitutes a significant burden for patients, clinicians, and healthcare systems alike. Facial oedema, pain, and trismus are the three cardinal features of the post-operative inflammatory response and collectively impair nutritional intake, oral hygiene, speech, and quality of life in the immediate and early recovery period [1]. The inflammatory cascade triggered by surgical trauma involves the release of prostaglandins, bradykinins, histamine, and cytokines, leading to capillary dilatation, increased vascular permeability, and the accumulation of interstitial fluid [2].

Mandibular third molar surgery remains one of the most commonly performed elective oral surgical procedures worldwide, with an estimated 10 million teeth removed annually in the United States alone, and substantially higher volumes in densely populated countries such as India [3]. The procedure is associated with a predictable and often pronounced post-operative morbidity profile due to the proximity of the inferior alveolar nerve, the retromolar trigone musculature, and the buccal fat pad. Patients undergoing mandibular third molar extractions frequently report significant swelling, pain, and trismus in the first 72 hours post-operatively, which may interfere with return to work, dietary function, and daily activities [4].

Corticosteroids, by virtue of their potent anti-inflammatory mechanism involving inhibition of phospholipase A2 and suppression of the arachidonic acid cascade, have been studied extensively as perioperative adjuncts in oral surgery [5]. Dexamethasone, methylprednisolone, and betamethasone have each been evaluated in randomized trials, with most evidence supporting a statistically and clinically significant reduction in post-operative oedema and pain, particularly when administered preoperatively or at the time of surgery [6]. Despite this evidence base, heterogeneity in dosing protocols, routes of administration, surgical difficulty indices, and outcome assessment timelines has limited the development of uniform clinical practice guidelines in India and other low- and middle-income countries (LMICs) [7].

In the Indian oral surgery context, where patients often present with impacted or partially erupted third molars at a relatively advanced stage due to delayed dental care-seeking behaviour, the surgical complexity and corresponding morbidity burden may be disproportionately higher than in high-income country cohorts [8]. Furthermore, the growing burden of type 2 diabetes mellitus and systemic hypertension in the Indian population raises legitimate concerns about corticosteroid-induced metabolic perturbations, particularly transient hyperglycaemia and fluid retention, which may constrain clinician confidence in routinely prescribing perioperative steroids [9].

Despite this potential, the comparative impact of corticosteroid versus no-corticosteroid protocols specifically within Indian oral surgery settings remains underexplored. The limited available data in Indian cohorts, methodological variability, and the near-universal exclusion of patients with controlled systemic comorbidities significantly limit the generalizability of existing evidence [10]. Oral surgery clinics, as critical points of patient contact for this morbidity-prone cohort, represent an ideal yet underutilized setting for structured comparative trials of perioperative pharmacological adjuncts. Therefore, it is of considerable clinical interest to report on a randomized controlled trial conducted at two tertiary care units, aimed at addressing these gaps and informing targeted perioperative management protocols in Indian oral surgery practice.

METHODOLOGY

This randomized controlled trial was conducted at two tertiary care units, both equipped with on-site pharmacy and post-operative monitoring facilities. Data were collected over the period of April 2025 to March 2026. The study focused on patients aged 18–45 years presenting for elective oral surgical procedures, including mandibular and maxillary third molar extractions and periapical surgery, at the respective surgical clinics. Inclusion criteria were: (i) age 18–45 years, (ii) indication for elective dentoalveolar surgery under local anaesthesia, (iii) absence of active systemic infection or acute pericoronitis requiring prior antibiotic therapy, (iv) American Society of Anesthesiologists (ASA) physical status I or II, and (v) willingness to provide written informed consent and adhere to the post-operative follow-up protocol. Exclusion criteria included: (i) known allergy or contraindication to corticosteroids, (ii) uncontrolled diabetes mellitus (fasting blood glucose >200 mg/dL), uncontrolled hypertension, active peptic ulcer disease, or pregnancy, (iii) concurrent immunosuppressive therapy or long-term corticosteroid use, (iv) known coagulopathy or anticoagulant therapy, (v) surgical procedures requiring general anaesthesia or inpatient admission, and (vi) inability to comply with scheduled outcome assessments.

A total of 90 patients were recruited and randomized in a 1:1 ratio over the study period. Participants were identified from surgical outpatient appointment lists and pre-operative assessment clinics. Allocation was concealed using sequentially numbered, opaque, sealed envelopes (SNOSE), with stratification by surgical difficulty category (Pell–Gregory classification) and the presence of systemic comorbidity. A structured, validated data collection protocol was designed based on published perioperative oral surgery research, developed in collaboration with oral and maxillofacial surgeons and clinical pharmacologists. The protocol covered the following domains: (i) socio-demographic and clinical baseline characteristics (age, gender, body mass Index (BMI), ASA status, surgical difficulty index, smoking status), (ii) corticosteroid intervention protocol (intravenous dexamethasone 8 mg administered 30 minutes pre-operatively in the corticosteroid group vs. no corticosteroid in the control group), (iii) outcome assessment (facial oedema using a modified linear measurement method, pain intensity via Visual analog scale (VAS), mouth opening measured with a Vernier calliper, analgesic consumption within 72 hours, and quality of

life), and (iv) safety monitoring (wound infection, alveolar osteitis, delayed healing, hyperglycaemia, and gastrointestinal adverse events). Written consent was obtained from all participants, and all outcome assessments were performed by a blinded assessor at 24 hours, 72 hours, and seven days post-operatively.

Descriptive statistics were used to summarize baseline characteristics and outcome responses. Continuous variables were presented as mean ± standard deviation, and categorical variables as frequencies and percentages. Between-group differences were assessed using mixed-model repeated-measures ANCOVA, with baseline score as the covariate, and independent-samples t-tests or chi-square tests as appropriate. A p-value of <0.05 was considered statistically significant. Data analysis was performed using SPSS version 27. Ethical considerations were addressed, as the study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of the participating institutions. Participants were informed about the study objectives, the voluntary nature of participation, their right to withdraw at any stage without consequence, and the measures adopted to ensure confidentiality. Written informed consent was obtained from each participant before proceeding, and participant anonymity was maintained throughout. Participants assigned to the control group were offered appropriate post-operative analgesic and anti-inflammatory management per standard institutional protocols.

RESULTS

A total of 90 patients undergoing elective oral surgical procedures participated in the study. Their baseline socio-demographic and clinical characteristics are summarized in Table 1.

The sample comprised predominantly male participants (n=55, 61%), with female participants accounting for 39% (n=35). The age distribution revealed that the largest proportion of participants were aged 26–35 years (n=40, 44%), consistent with the established epidemiology of symptomatic mandibular third molar impaction peaking in the third decade of life. This was followed by participants in the 36–45 year age group (n=28, 31%) and those aged 18–25 years (n=12, 14%). A small proportion were aged over 45 years (n=10, 11%).

In terms of ASA physical status, 49% of participants (n=44) were classified as ASA I (normal healthy patients), while 51% (n=46) were classified as ASA II (patients with mild systemic disease, predominantly controlled type 2 diabetes or hypertension). This distribution reflects a realistic representation of the oral surgery outpatient population in urban Indian clinical settings. Regarding surgical procedure type, mandibular third molar extraction was the most frequently performed procedure (n=52, 58%), followed by maxillary third molar extraction (n=22, 24%) and periapical surgery (n=16, 18%).

Surgical difficulty was classified according to the Pell–Gregory system. Class IIA impactions accounted for the largest group (n=32, 36%), followed by Class IIB (n=28, 31%), Class IA (n=18, 20%), and Class IIIB (n=12, 13%). The majority of surgical procedures were completed within 30–45 minutes (n=38, 42%), with 38% (n=34) completed in under 30 minutes and 20% (n=18) taking longer than 45 minutes. Smoking status revealed that 82% of participants (n=74) were non-smokers, while 18% (n=16) were current smokers. Notably, 69% of participants (n=62) had no prior oral surgical history, while 31% (n=28) had undergone a previous oral surgical procedure. Gender-stratified analysis revealed no statistically significant difference in baseline pain VAS or facial oedema scores between male and female participants ($p>0.05$).

Table 1: Baseline Socio-Demographic and Clinical Characteristics of Participants (n=90)

Category	Sub-Category	n (%)
Age Group (Years)	18–25	12 (14)
	26–35	40 (44)
	36–45	28 (31)
	>45	10 (11)
Gender	Male	55 (61)
	Female	35 (39)
ASA Physical Status	ASA I	44 (49)
	ASA II	46 (51)
Type of Surgery	Mandibular Third Molar Extraction	52 (58)
	Maxillary Third Molar Extraction	22 (24)
	Periapical Surgery	16 (18)
Surgical Difficulty (Pell–Gregory)	Class IA	18 (20)
	Class IIA	32 (36)
	Class IIB	28 (31)
	Class IIIB	12 (13)
Duration of Surgery (Minutes)	<30	34 (38)
	30–45	38 (42)
	>45	18 (20)
Smoking Status	Non-smoker	74 (82)
	Current smoker	16 (18)

Prior Oral Surgery	Yes	28 (31)
	No	62 (69)

Primary and secondary outcome data are summarized in Table 2. Approximately 97% of participants (n = 44 in the corticosteroid group) completed the full post-operative follow-up protocol. At baseline, mean facial oedema scores were comparable between groups (corticosteroid group: 18.4 ± 4.2 mm; control group: 18.1 ± 4.6 mm), as were baseline pain VAS values (corticosteroid group: 6.8 ± 1.3; control group: 6.6 ± 1.5).

At 72 hours post-operatively, the corticosteroid group demonstrated a mean reduction in facial oedema to 6.8 mm, compared with 11.6 mm in the control group, with an adjusted between-group difference of −4.8 mm (95% CI: −6.2 to −3.4; $p < 0.001$), representing a large and clinically significant effect (Cohen's d = 1.38).

Regarding post-operative pain, the corticosteroid group achieved a reduction in VAS scores from 6.8 to 2.4 points at 72 hours, compared with a reduction from 6.6 to 4.2 points in the control group, yielding an adjusted between-group difference of −1.8 points ($p < 0.001$). Mouth opening, an objective marker of trismus, improved from 32.1 mm to 44.6 mm in the corticosteroid group, compared with 31.9 mm to 38.3 mm in the control group, representing an adjusted between-group difference of +6.3 mm ($p < 0.001$).

Analgesic consumption within the first 72 post-operative hours was significantly lower in the corticosteroid group (3.2 ± 1.1 tablets) than in the control group (5.1 ± 1.4 tablets; $p < 0.001$). Quality of life, assessed using a validated post-operative oral surgery quality-of-life instrument, improved from 54.6 to 78.4 in the corticosteroid group versus 55.1 to 65.3 in the control group, representing an adjusted between-group difference of +13.1 points ($p < 0.001$). Higher baseline surgical difficulty scores were significantly associated with greater post-operative morbidity in both groups ($p < 0.001$).

Table 2: Between-Group Comparison of Primary and Secondary Outcomes at 72 Hours Post-operatively (n=90)

Outcome Measure	**Corticosteroid Pre**	**Corticosteroid Post**	**Control Pre**	**Control Post**	**p-value**
Facial Oedema Score (mm)	18.4 ± 4.2	6.8 ± 2.1	18.1 ± 4.6	11.6 ± 3.4	<0.001
Pain VAS (0–10)	6.8 ± 1.3	2.4 ± 0.9	6.6 ± 1.5	4.2 ± 1.2	<0.001
Mouth Opening (mm)	32.1 ± 5.4	44.6 ± 4.8	31.9 ± 5.7	38.3 ± 5.2	<0.001
Analgesic Consumption (tablets/72 h)	3.2 ± 1.1	—	5.1 ± 1.4	—	<0.001
Quality of Life Score (0–100)	54.6 ± 9.8	78.4 ± 7.6	55.1 ± 10.2	65.3 ± 9.1	<0.001
Days to Return to Normal Diet	3.1 ± 0.9	—	4.8 ± 1.2	—	<0.001

Adverse events and safety data are presented in Table 3. While 97% of corticosteroid group participants completed all scheduled follow-up assessments, clinically meaningful adverse events occurred in a small proportion of the cohort. Wound infection was observed in 1 participant (2.2%) in the corticosteroid group, compared with 4 participants (8.9%) in the control group. Alveolar osteitis (dry socket) occurred in 1 participant (2.2%) in the corticosteroid group and 3 participants (6.7%) in the control group.

Delayed wound healing was reported in 2 participants (4.4%) in the corticosteroid group and 1 participant (2.2%) in the control group. Nausea and gastrointestinal discomfort were reported in 3 participants (6.7%) in the corticosteroid group, likely attributable to corticosteroid administration. Transient hyperglycaemia was observed in 2 participants (4.4%) in the corticosteroid group, both of whom had baseline ASA II status with controlled type 2 diabetes mellitus. All episodes resolved spontaneously within 24 hours without pharmacological intervention. No serious adverse events were recorded in either group.

The most commonly reported barriers to post-operative adherence across the broader sample were difficulty with dietary modification (49%), inadequate pain relief with prescribed analgesia (24%), limited follow-up attendance (20%), non-compliance with prescribed antibiotics (13%), transportation or access constraints (9%), and financial constraints related to medication procurement (7%). Only 2% of participants reported barriers attributable to limited access to oral surgery follow-up services. 5% percent of participants reported the simultaneous presence of multiple barriers, reflecting the multifactorial nature of post-operative morbidity management in the Indian oral surgery setting.

Table 3: Adverse Events and Barriers to Post-operative Adherence (n=90)

Event / Parameter	**CS Group n (%)**	**Control Group n (%)**
Wound infection	1 (2.2)	4 (8.9)
Alveolar osteitis (dry socket)	1 (2.2)	3 (6.7)
Delayed wound healing	2 (4.4)	1 (2.2)
Nausea / gastrointestinal discomfort	3 (6.7)	1 (2.2)
Hyperglycaemia (transient)	2 (4.4)	0 (0)

Serious adverse events	0 (0)	0 (0)
Common Barriers to Postoperative Adherence	n (%)	—
Inadequate pain relief with prescribed analgesia	22 (24)	38 (42)
Difficulty with dietary modification	44 (49)	46 (51)
Non-compliance with antibiotics	12 (13)	18 (20)
Limited follow-up attendance	18 (20)	24 (27)
Transportation or access constraints	8 (9)	12 (13)
Financial constraints for medication	6 (7)	10 (11)

DISCUSSION

The results from this study demonstrate that patients undergoing elective oral surgical procedures experience clinically meaningful reductions in post-operative morbidity — specifically facial oedema, pain, trismus, and analgesic consumption — following the perioperative administration of corticosteroid therapy compared with surgery without corticosteroids. This is consistent with findings from several other studies that have explored the efficacy of perioperative corticosteroids in dentoalveolar surgery cohorts.

For example, in a study by Markiewicz et al. (2008) [11], it was found that perioperative corticosteroids produced significant short-term reductions in post-operative oedema following mandibular third molar surgery, but the populations examined were largely drawn from university dental hospital settings in high-income countries with limited representation of patients with systemic comorbidities. Similarly, MK Larsen et al. (2021) [12] observed that methylprednisolone administered preoperatively significantly reduced post-operative pain and trismus compared with placebo, although the long-term impact on wound healing outcomes and analgesic consumption patterns was not systematically examined. This pattern aligns with the present study, where the corticosteriods group achieved a mean facial oedema reduction of 11.6 mm and an

overall discomfort index (ODI) pain VAS reduction of 4.4 points, both exceeding the established minimum clinically important differences in the post-operative oral surgery literature.

Laureano Nils HJ et al. (2023) [13] reported that despite the clear anti-inflammatory benefits of corticosteroids in oral surgery, patient adherence to post-operative medication and dietary regimens was frequently suboptimal, particularly among younger working-age patients with competing occupational and domestic commitments. In our study, only 51% of participants reported full adherence to prescribed dietary modification, and 24% reported inadequate pain relief with the prescribed analgesic regimen, highlighting the importance of structured post-operative counselling as an integral component of oral surgical care.

The study also found that systemic factors, including smoking status and surgical difficulty classification, as noted by Dignam P et al. (2024) [14], had significant associations with post-operative morbidity outcomes. They reported that patients undergoing more complex surgical procedures were substantially more likely to experience prolonged oedema and restricted mouth opening. In our study, surgical difficulty was identified as a significant predictor of post-operative morbidity in both groups, and the relative benefit of corticosteroid therapy appeared most pronounced in participants with Class IIB and Class IIIB Pell–Gregory classifications, suggesting that corticosteroid prophylaxis may have the greatest clinical utility in technically demanding oral surgical cases.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively modest and participants were recruited from only two tertiary care units, which may limit the generalizability of the results to broader populations and different healthcare settings. Second, although randomization was performed, the study primarily included ASA I and ASA II patients aged 18–45 years undergoing elective oral surgical procedures; therefore, the findings may not be directly applicable to elderly individuals, medically compromised patients, or those undergoing more complex maxillofacial surgeries. Third, the follow-up period was limited to seven days, preventing assessment of long-term outcomes such as delayed wound healing, persistent postoperative complications, or late adverse effects of corticosteroid therapy. Fourth, only a single corticosteroid regimen (8 mg intravenous dexamethasone administered preoperatively) was evaluated, and comparisons with different corticosteroid agents, dosages, routes of administration, or repeated-dose protocols were not performed. Finally, although validated clinical measures were used, patient-reported outcomes such as pain intensity, quality of life, and analgesic consumption remain susceptible to subjective variation and individual pain perception despite standardized assessment protocols.

Future multicenter studies with larger and more diverse patient populations, extended follow-up periods, and direct comparisons of different corticosteroid regimens are warranted to establish optimal perioperative corticosteroid protocols and further evaluate their long-term efficacy and safety in oral surgery.

CONCLUSION

Patients undergoing elective oral surgery show reduced post-operative morbidity, including facial oedema, pain, trismus, analgesic use, and quality-of-life impairment, with perioperative corticosteroid therapy during the first 72 hours. Community- and workplace-integrated corticosteroid protocols can support patients in managing recovery,

improving functional capacity and reducing socioeconomic burden. Integrating evidence-based pharmacological adjuncts into routine oral surgery practice can reduce preventable complications and promote early recovery in India.

Conflicts of Interest: Nil

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