

## Comparison of Dexamethasone and Local Anaesthetic Infiltration in Management of Postoperative Nausea and Vomiting in Pediatric Tonsillectomy

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### ABSTRACT

**Objective:** Comparison of the effectiveness of intravenous Dexamethasone and pre-incision infiltration of local anesthetic among Pediatric tonsillectomy patients in reduction of postoperative nausea, vomiting, and pain.

**Study Design:** Quasi-Experimental Study.

**Place and Duration of Study:** Combined Military Hospital, Rawalpindi, Pakistan, from Jan to Jun 2022.

**Methodology:** Pediatric patients aged 04 to 13 years undergoing tonsillectomy under general anesthesia were enrolled in the study. Group-A was administered intravenous Dexamethasone 0.5 mg/kg (up to 16 mg), and Group-B was administered a 24ml of local anesthesia as pre-incision infiltration.

**Results:** A total of 126 patients enrolled in the study, with equal distribution in each group. In the post-anesthesia recovery unit, 10(15.9%) of patients in Group-A had vomiting, whereas 2(3.2%) in Group-B experienced vomiting ( $p$ -value 0.03). After 24 hours, the PONV frequency rose to 17(27.0%) and 6(9.5%) respectively, in Group-A and Group-B ( $p$ -value 0.02), with compatible results at 48 hours, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> day postoperatively. Group-A has shown higher consumption of postoperative analgesics in post post-anesthesia recovery unit and throughout from 1<sup>st</sup> to 5<sup>th</sup> day. 10(16.2%) and 21(32.8%) patients in Groups A and B, respectively, were able to drink during their PACU stay ( $p$ -value 0.05).

**Conclusion:** Local anesthetic infiltration is an effective modality for reduction of postoperative nausea and vomiting, along with analgesic potential in Pediatric patients undergoing tonsillectomy under general anesthesia.

**Keywords:** Corticosteroids, Dexamethasone, Local infiltration, Nausea, Pain, Postoperative, Vomiting.

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### INTRODUCTION

Literature says that 23% to 71% postoperative nausea and vomiting (PONV) frequency is recorded with tonsillectomy surgeries.<sup>1</sup> Unpleasant manifestation of PONV could render oral intake that can result in dehydration, thus having a propensity to increase the frequency of readmission.<sup>2</sup>

These factors are attributable to the dissatisfaction of surgeons, parents, and patients. Standard optimal guidelines are deficient concerning postoperative tonsillectomy management.<sup>3</sup> Efforts are in hand via surgical and anesthetic trials for the establishment of standard protocols for post-tonsillectomy postoperative Nausea and Vomiting (PONV) and pain.<sup>4,5</sup>

Consequently, a variety of local anesthesia agents at different concentrations and doses have been considered for tonsillar infiltration to reduce

postoperative morbidity and make patient recovery easier.<sup>6</sup> Several studies on this topic have shown favourable results.<sup>7</sup>

Corticosteroids such as intravenous Dexamethasone are interpreted to be a useful adjuvant in the reduction of PONV and analgesia provision attributable to anti-inflammatory properties of corticosteroids, hence early resumption of oral intake and enhanced recovery of the patient.<sup>8</sup> These modalities have the added advantage of decreasing opioid and analgesic consumption.<sup>9,10</sup>

Based on the properties of Dexamethasone and the local anesthetic pre-incision infiltration technique, the quasi-experimental study was designed to compare intravenous Dexamethasone and the local anesthetic pre-incision infiltration in Pediatric patients undergoing tonsillectomy in general anesthesia. The primary outcome determined was the PONV frequency during the initial five days postoperatively, whereas the secondary objective was effectiveness in terms of analgesia postoperatively.

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## METHODOLOGY

This Quasi-Experimental Study was conducted at Tertiary Care Institute of Combined Military Hospital, Rawalpindi, Pakistan, from Jan to Jun 2022 after approval from the Ethical Research Committee of the institute (ERC Approval Number- 248).

With 80% power of the study, 95% confidence interval, and 0.05  $\alpha$ , a sample size of 47 patients was calculated with a 3.1% frequency of postoperative nausea and vomiting after tonsillectomy with adjuvant local anaesthesia infiltration.<sup>11</sup> A total of 126 patients enrolled in the study, with equal distribution of 63 study subjects in each group via a consecutive non-probability sampling technique. Written informed consent was taken from the parents/guardians of patients after explaining procedures and protocols in detail.

**Inclusion Criteria:** Patients aged 4 to 13 years undergoing total or subtotal tonsillectomy (with or without adenoidectomy) under general anesthesia, classified as American Society of Anaesthesiologists status I and II, were included in the study.

**Exclusion Criteria:** Patients who have a relevant drug history of anti-emetics, steroids, antihistamines, or psychoactive drugs within twenty-four hours preceding surgery, patients with suspected malignant neoplasm, presentation of acute pharyngeal infection, patients with a history of diabetes mellitus, asthma, coagulation disorders, and hypersensitivity to study drug constituents were excluded from the study.

Group-A received intravenous Dexamethasone 0.5 mg/kg (maximum up to 16 mg), and Group-B received pre-incision local anesthesia infiltration in a 24ml dose (3 ml 2% Lidocaine plain, 3 ml 2% Lidocaine with Epinephrine, and 3 ml of 0.5% Bupivacaine) diluted with 0.9% Saline. (Figure) With a 25 G (3.5 cm) curved needle, infiltration was performed at the superior pole of the tonsil. Tonsil seizing forceps grasped and pulled tonsil medially with the lateral introduction of the needle to the superior pole with objective of aiming the inferior pole within the plane of the capsule and the bed. The mixture was infiltrated into the desired space in a retrograde manner after aspiration. The needle was pulled slowly upwards following the same entry tract, and the bulk of the mixture was delivered at the middle of the trajectory. Patients were premedicated with intravenous Midazolam (1 mg), and general anesthesia induction was performed with intravenous Propofol (2mg/kg). Endotracheal intubation was

carried out with a loading dose of intravenous Atracurium (0.5 mg/kg) after ensuring ventilation for 3-5 minutes. Anesthesia was maintained with Isoflurane at the rate of 1.5% minimum alveolar ventilation, along with oxygen at 60% and air at 40%. At the end of the surgery, Neostigmine and Glycopyrrolate antagonized neuromuscular blockade. Intravenous Paracetamol (15 mg/kg) as an adjuvant analgesic was administered to all patients about 15 min before extubation, and awake extubation was carried out.

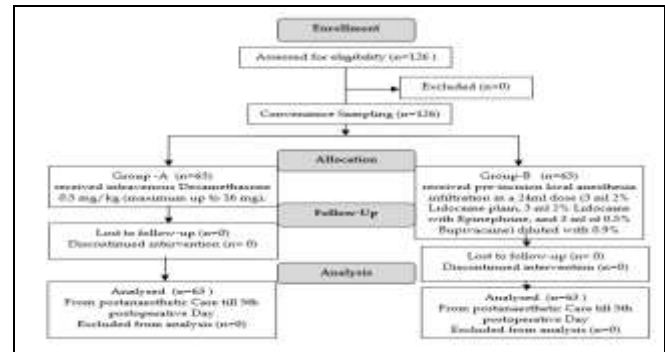


Figure: Patient Flow Diagram (n= 126)

Patient's demographic profile, amount of Paracetamol administered as analgesic, duration of surgery, hemodynamic profile, and oxygen concentration (SpO<sub>2</sub>). Postoperative data gathered were frequency of PONV, Visual Analogue Scale (VAS) scores for pain, and antiemetic and analgesic consumption. Retching refers to defined nausea. Intravenous Ondansetron (0.15 mg/kg) was administered if the patient had one or more episodes of vomiting, and a home prescription of 0.25 mg/kg Domperidone in a twice-daily dose was given. The severity of pain was determined with a Visual Analogue Score on a scale of 0 – 10 from minimum to maximum. A threshold score of four was used for the administration of analgesia in form of intravenous Paracetamol (15mg/Kg) and as suspension (240mg/ml) for the home prescription. Parents' satisfaction was endorsed as satisfied, moderately satisfied, and unsatisfied. Post-discharge data was recorded on a pre-designed proforma to be brought along on follow-up visits.

Data was analyzed by using Statistical Package for Social Sciences (SPSS) 22.00. Continuous variables were reported as Mean $\pm$ SD, and categorical data were interpreted as frequency and percentage. The chi-square test and independent sample t-test, (whichever

applicable) were used. A  $p$ -value $<0.05$  was considered statistically significant.

## RESULTS

A total of 126 patients enrolled in the study, with 63 participants in each group. Demographic and hemodynamic profiles are enumerated in Table-I. In the Postanaesthetic Care Unit (PACU), Mean arterial pressure (MAP) and Heart Rate (HR) were compatible parameters between the two groups.

In the post-anesthesia recovery unit, 10(15.9%) of patients in Group-A had vomiting, whereas 3.2%(2) in Group-B experienced vomiting ( $p$ -value 0.03). After 24 hours, the PONV frequency rose to 17(27.0%) and 6(9.5%) respectively, in Group-A and Group-B ( $p$ -value 0.02), with compatible results at 48 hours, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> day postoperatively. Group-A has shown higher consumption of postoperative analgesics in post post-anesthesia recovery unit and throughout from 1<sup>st</sup> to 5<sup>th</sup> day. (Table-II) The frequency of postoperative nausea and vomiting in study subjects of both groups from post post-anesthesia care unit till the 3<sup>rd</sup> postoperative day is shown in Table-III. The pain scores of the study participants were measured through the Visual Analogue Scale. The comparison of scores between both groups is shown in Table-IV.

**Table-I: Demographic and Postoperative Hemodynamic Profile (n=126)**

Characteristics	Group-A (n=63)	Group-B (n=63)	$p$ -value
Gender			
Male	39(44.3%)	31(49.3%)	
Female	24(%)	32(50.7%)	0.20
Age	4.9 $\pm$ 2.8	6.1 $\pm$ 3.0	0.72
Preoperative Hemodynamic Data			
Heart Rate (bpm)	96.4 $\pm$ 11.1	96.6 $\pm$ 12.1	0.91
Mean Arterial Pressure (mm Hg)	64.6 $\pm$ 6.8	65.4 $\pm$ 8.1	0.61
Oxygen Saturation (%)	99.8 $\pm$ 0.5	99.82 $\pm$ 0.5	0.82
Pre-Incision Hemodynamic Data			
Heart Rate(bpm)	94.4 $\pm$ 11.3	95.0 $\pm$ 13.9	0.79
Mean Arterial Pressure (mm Hg)	63.8 $\pm$ 7.3	64.8 $\pm$ 8.8	0.78
Oxygen Saturation (%)	99.6 $\pm$ 0.1	99.8 $\pm$ 0.6	0.31
Post-Incision Hemodynamic Data			
Heart Rate(bpm)	103.6 $\pm$ 14.1	104.5 $\pm$ 15.7	0.73
Mean Arterial Pressure (mm Hg)	70.3 $\pm$ 9.5	70.7 $\pm$ 10.9	0.85
Oxygen Saturation (%)	99.6 $\pm$ 1.13	99.7 $\pm$ 0.5	0.25
Duration of Surgery (Minutes)	31.8 $\pm$ 6.7	33.3 $\pm$ 7.4	0.18
PACU Hemodynamic Data			
Heart Rate(bpm)	95.4 $\pm$ 11.3	95.0 $\pm$ 13.9	0.81
Mean Arterial Pressure (mm Hg)	63.8 $\pm$ 7.3	64.8 $\pm$ 8.8	0.79
Oxygen Saturation (%)	99.6 $\pm$ 0.1	99.7 $\pm$ 0.6	0.31

\*bpm – beats per minute

PACU - Post-Anesthesia Care Unit

## DISCUSSION

The study demonstrated that local anaesthetic infiltration significantly reduced postoperative nausea and vomiting and provided effective analgesia in Pediatric patients undergoing tonsillectomy under general anesthesia. Literature is compared with variables of the study, and most of the results have been incongruent with this study.

**Table-II: Postoperative Analgesic Consumption in First Five Days. (n=126)**

Analgesic Consumption Duration (%)	Group-A (n = 63)	Group-B (n = 63)	$p$ -value
PACU	13(20.6%)	2(3.3%)	0.004
1st Day (24 Hours)	25(33.3%)	21(39.7%)	0.57
2nd Day (48 Hours)	32(50.8%)	17(27.0%)	0.01
3rd Day	31(49.2%)	6(9.5%)	$<0.001$
4th Day	20(31.7%)	2(3.3%)	$<0.001$
5th Day	5(7.9%)	0(0%)	0.05

\*PACU - Post-Anesthesia Care Unit

**Table-III: Frequency of Postoperative Nausea and Vomiting. (n=126)**

Frequency of PONV	Group-A (n = 63)	Group-B (n = 63)	$p$ -value
PACU Duration (min)	89.9 $\pm$ 28.3	73.32 $\pm$ 25.7	0.002
PACU	10(15.9%)	2(3.2%)	0.03
24 Hours	17(27.0%)	6(9.5%)	0.02
PONV – 48 Hours	6(9.5%)	0(0%)	0.02
PONV – 3rd Day	0(0%)	1(1.6%)	1.0

\*PACU - Post-Anesthesia Care Unit

PONV – Postoperative Nausea and Vomiting

**Table-IV: Postoperative Pain Scores (measured on Visual Analogue Scale) (n=126)**

Postoperative Pain Scores	Group-A (n = 63)	Group-B (n = 63)	$p$ -value
PACU	3.71 $\pm$ 2.06	2.42 $\pm$ 1.78	$<0.001$
24 Hours	3.20 $\pm$ 1.80	2.36 $\pm$ 1.56	0.006

\*PACU - Post-Anesthesia Care Unit

Tonsillitis is fairly common in children under 12 - 14 years of age. PONV and pain after tonsillectomy are anticipated for several days with behavioural disturbances, school absenteeism, and parental agony association. A successful surgical outcome relies on pre-operative care with consistent efforts till discharge of the patient, thereby enhancing recovery and earlier rehabilitation to resume day-to-day activities. Aouad et al., compared intravenous Dexamethasone versus intravenous Methylprednisolone and concluded that both agents have equivocal potential for prevention of PONV after tonsillectomy.<sup>11</sup>

Evidence-based guidelines called The Paradise criteria by the American Academy of Otolaryngology-Head and Neck Surgery Foundation highlighted by Baugh et al., suggest that tonsillectomy should be recommended where children suffer from seven or more documented sore throat episodes in one year, or five or more episodes annually in two consecutive years, or three or more episodes annually in three

consecutive years.<sup>12</sup> Hence, it shows that Pediatric patients are frequently at risk of undergoing tonsillectomy.

The results that our study showed that the pre-incision local anesthesia infiltration resulted in a remarkably decreased PONV frequency and better pain relief with less requirement of additional analgesics compared to the traditional use of intravenous Dexamethasone in the postanaesthetic care unit, at twenty-four and forty-eight hours, and subsequently at the 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> postoperative days.

Messerer *et al.*, established that the main risk factors for PONV include the intraoperative administration of opioids during the recovery room stay and at the ward, the intraoperative use of non-opioids (diclofenac), and the specific type of surgical procedure.<sup>13</sup>

Preoperative dexamethasone 0.5 mg.kg(-1) IV reduced both postoperative vomiting and pain in children after electrocautery tonsillectomy, as determined by Elhakim *et al.*, The results reflect similar objectives achieved by this study. Analysing patients' recovery post tonsillectomy concluded that under optimal conditions, a stat intravenous dose of Dexamethasone is a cheap and practical modality for the reduction of PONV.<sup>14</sup>

Czarnetky *et al.*, recognised a dose-dependent elevated post-tonsillectomy haemorrhage frequency after administration of Dexamethasone, as none of the patients exhibited haemostatic manoeuvres, whereas patients in respective Dexamethasone batches necessitated surgical intervention to ensure haemostasis (5.7%, 2%; 8%, respectively). They employed three different concentrations of Dexamethasone (0.05, 0.15, or 0.5 mg/kg) with a sample size comprising 50 Pediatric patients.<sup>15</sup>

In another study conducted by Jochen *et al.*, no variation in PONV was observed irrespective of intravenous Dexamethasone administration.<sup>16</sup> This contradicted the findings of this study. Nadeem *et al.*, also quoted similar to this study that Dexamethasone reduces pain during the initial first 24 hours postoperatively, owing to anti-inflammatory and analgesic properties of corticosteroids.<sup>17</sup>

Tonsil infiltration with local anesthetic is assumed to have great analgesic potential, as exhibited in this study. Patients had relatively lower postoperative pain scores with local anaesthetic administration. The aforementioned mixture was

preferred owing to prolonged duration following surgery without any notable adverse effects. A curved needle provided an added advantage of preventing deep local anesthesia infiltration in the peritonsillar zone, therefore harbouring complications of taste disturbance, vocal cord paralysis, or osteomyelitis.<sup>18</sup>

The study was limited by a small sample size, which may affect the generalizability of the results. The randomized control trials are suggested for reinforcing the results. Long-term outcomes and delayed postoperative complications were not assessed.

Further trials can be carried out to evaluate the correlation between pain and PONV in Pediatric tonsillectomy patients. Meanwhile, the local anesthesia infiltration technique can provide worthwhile results in conjunction with NSAIDs and paracetamol.

## CONCLUSION

Local anesthetic infiltration proved to be an effective technique in minimizing postoperative nausea and vomiting (PONV) in Pediatric tonsillectomy patients.

In addition to its antiemetic effect, it provided significant postoperative pain relief.

Children who received local anesthetic infiltration experienced fewer episodes of nausea and required fewer rescue antiemetics.

Analgesic requirements were also reduced in the immediate postoperative period.

These findings support its dual benefit in improving overall recovery and patient comfort under general anesthesia.

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## Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MSB & SA: Data acquisition, data analysis, critical review, approval of the final version to be published.

US & SA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AK & HA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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