



GLOBAL JOURNAL OF MEDICAL RESEARCH: J  
DENTISTRY & OTOLARYNGOLOGY  
Volume 24 Issue 2 Version 1.0 Year 2024  
Type: Double Blind Peer Reviewed International Research Journal  
Publisher: Global Journals  
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

# Evaluation of the Incidence and Risk Factors of Nausea and Postoperative Vomiting in Oral and Maxillofacial Surgeries

By Soraia Rodrigues de Gois, DDS, MsC, Isabelle Ramos Pereira Lima, DDS, Francisco Samuel Rodrigues Carvalho, DDS, MSc, Paulo Goberlânio de Barros Silva, DDS, MSc, PhD, Eduardo Costa Studart Soares, DDS, MSc, PhD & Rafael Linard Avelar DDS, MSc, PhD

*Federal University of Ceará*

**Abstract-** The persistence of postoperative nausea and vomiting (PONV) episodes can cause further complications to the patient, such as: dehiscence of the surgical wound, dehydration, esophageal rupture, hematoma, hemorrhage, and may even lead to death. Considering its high incidence in surgical procedures of the face and oral cavity, the present study aimed to evaluate the incidence of PONV episodes in oral and maxillofacial surgeries under general anesthesia as well as to identify the main risk factors associated with these episodes. This analytical, observational, retrospective study was based on the documentary analysis of 200 medical records of patients who underwent oral and maxillofacial surgery at the Walter Cantídio University Hospital of the Federal University of Ceará.

**Keywords:** *anesthesia, nausea, vomiting.*

**GJMR-J Classification:** *NLM Code: WO200, WU600*



EVALUATION OF THE INCIDENCE AND RISK FACTORS OF NAUSEA AND POSTOPERATIVE VOMITING IN ORAL AND MAXILLOFACIAL SURGERIES

*Strictly as per the compliance and regulations of:*



RESEARCH | DIVERSITY | ETHICS

© 2024. Soraia Rodrigues de Gois, DDS, MsC, Isabelle Ramos Pereira Lima, DDS, Francisco Samuel Rodrigues Carvalho, DDS, MSc, Paulo Goberlânio de Barros Silva, DDS, MSc, PhD, Eduardo Costa Studart Soares, DDS, MSc, PhD & Rafael Linard Avelar DDS, MSc, PhD. This research/review article is distributed under the terms of the Attribution-Non Commercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0). You must give appropriate credit to authors and reference this article if parts of the article are reproduced in any manner. Applicable licensing terms are at <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

# Evaluation of the Incidence and Risk Factors of Nausea and Postoperative Vomiting in Oral and Maxillofacial Surgeries

Soraia Rodrigues de Gois, DDS, MSc <sup>α</sup>, Isabelle ramos pereira lima, DDS <sup>σ</sup>, Francisco Samuel Rodrigues Carvalho, DDS, MSc <sup>ρ</sup>, Paulo Goberlânio de Barros Silva, DDS, MSc, PhD <sup>ω</sup>, Eduardo Costa Studart Soares, DDS, MSc, PhD <sup>¥</sup> & Rafael Linard Avelar DDS, MSc, PhD<sup>§</sup>

**Abstract-** The persistence of postoperative nausea and vomiting (PONV) episodes can cause further complications to the patient, such as: dehiscence of the surgical wound, dehydration, esophageal rupture, hematoma, hemorrhage, and may even lead to death. Considering its high incidence in surgical procedures of the face and oral cavity, the present study aimed to evaluate the incidence of PONV episodes in oral and maxillofacial surgeries under general anesthesia as well as to identify the main risk factors associated with these episodes. This analytical, observational, retrospective study was based on the documentary analysis of 200 medical records of patients who underwent oral and maxillofacial surgery at the Walter Cantídio University Hospital of the Federal University of Ceará. Data on patient profile and surgical procedures were collected. PONV episodes were reported in 9% of cases, with 100% occurring in the first 12 postoperative hours. Non-smoking patients, who underwent surgery via intraoral access lasting 3 hours or longer and with greater blood loss were more likely to experience PONV episodes. The identification of patients at greater risk as well as the understanding of the impact that certain surgical procedures have on the occurrence of PONV are fundamental to plan and establish strategies to control PONV episodes.

**Keywords:** *anesthesia, nausea, vomiting.*

## I. INTRODUCTION

Elective surgery under general anesthesia is a very safe procedure, especially nowadays with the advent of new technologies aimed at patient comfort. Nevertheless, surgeries may still cause postoperative complications regardless of the procedure, such as bleeding, infections, wound dehiscence, nausea, vomiting, etc. Among these complications, post-operative nausea and vomiting

(PONV) is often neglected, given that there is still no well-defined prevention protocol.

Nausea is an unpleasant sensation associated with epigastric discomfort and the urge to vomit (1) whereas vomiting is the rapid and forced expulsion of gastric contents through the mouth (2). PONV is defined as the development of any emetic episode (nausea and/or vomiting) resulting from surgical procedures (McCracken, 2008).

The persistence of postoperative emetic episodes could lead to further complications such as dehiscence of the surgical wound, dehydration, esophageal rupture, hematoma, hemorrhage, aspiration of gastric contents, increased intracranial and intraocular pressure, and may even result in death (4).

Numerous factors have been associated with a higher incidence of these complications, including those related to the patient (age, sex, smoking, previous history of PONV and gastrointestinal tract problems), anesthesia (duration, type, use of inhalation agents, use of opioids, hydration, etc.), and the surgical procedure (duration and type; laparoscopic, abdominal surgery, etc.) (5).

Treatment of PONV has been carried out with classic antiemetics or drugs of different classes with secondary antiemetic effects, as is the case of antihistamines, propofol (6-8), and dexamethasone (9). The latter is frequently cited in the literature for its antiemetic and membrane-stabilizing effect; however, its mechanism of action and its application have not been widely studied (9). The medication used to control PONV generally presents inconvenient side effects, such as extrapyramidal reactions, and also generates financial burden for the patient and the hospital, as postoperative complications increase the length of hospital stay of the patient (10).

In oral surgery, emetic phenomena can extend beyond a simple discomfort and inconvenience. Vomiting episodes can potentially lead to open sutures, contamination of the surgical site in intraoral surgeries and aspiration of gastric content in patients with intermaxillary fixation (10).

**Author ρ:** Postgraduate Student of Oral and Maxillofacial Surgery, Postgraduate Program in Dentistry of the Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará (UFC), Fortaleza, CE, Brazil.

**Author α ω §:** Adjunct Professor of Dentistry at Christus University Center (UNICHRISTUS), Fortaleza, CE, Brasil.  
e-mail: RAFAEL.LINARD@HOTMAIL.COM

**Author σ:** Adjunct Professor of Oral Radiology of the Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará (UFC), Fortaleza, CE, Brazil.

**Author ¥:** Professor of Oral and Maxillofacial Surgery of the Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará (UFC), Fortaleza, CE, Brazil.

Considering the relative frequency of PONV episodes in surgical procedures involving the face and oral cavity, the need for a safe and comfortable postoperative recovery for patients and the need to recognize patient groups at higher risk of PONV, the purpose of this study is to identify the incidence of this postoperative complication as well as the main associated risk factors.

## II. MATERIALS AND METHODS

This analytical, observational, retrospective study carried out a documentary analysis of medical records of patients who underwent oral and maxillofacial surgery in a hospital environment and under general anesthesia, from September 2012 to September 2017, at the Oral and Maxillofacial Surgery and Traumatology Service of the Walter Cantídio University Hospital of the Federal University of Ceará (UFC). This project was approved by the UFC Research Ethics Committee, section of the Walter Cantídio University Hospital, under registration number 2,804,771.

Medical records of patients with no systemic comorbidities, classified as ASA I according to the ASA Physical Status Classification System of the American Society of Anesthesiologists (ASA), of both sexes and with no ages age restriction were included after patients signed a consent form agreeing to participate in the study. Poorly filled out and/or illegible records were excluded from the sample.

The sample was calculated based on the PONV frequency in previous studies which reported a frequency of approximately 20%. We also considered the average of the total patient population operated at the Oral and Maxillofacial Surgery and Traumatology Service of the Walter Cantídio University Hospital in the study period of 5 years, totaling approximately 800 patients. Using a 95% reliability criterion, we reached the minimum number of 189 patients for the sample to be representative.

A standardized form collected the following data: a) patient biometrics (age, sex, weight and height), b) previous medical history (surgeries, systemic disease, episodes of nausea and vomiting), c) social history (smoking, alcohol and drugs); d) medications used in the preoperative period; e) anesthetic evaluation (drugs used in general anesthesia and anesthesia time); f) surgical evaluation (type of surgery, type of access, surgery duration and volume of blood loss); g) assessment of episodes of nausea (presence or not, which period of the postoperative recovery, if rescue medication was used, which medication, dose); and h) evaluation of vomiting episodes (presence or not, which period of the postoperative recovery, if rescue medication was used, which medication, dose).

The obtained data were submitted to statistical analysis with the Statistical Package for the Social

Sciences (SPSS -version 17.0 for Windows® 2018). Descriptive statistics (mean, median and standard deviation) and frequency were calculated. Kolmogorov-Smirnov test was used to assess the normality of data distribution. Chi-square test was applied to analyze the association of the study variables (parametric data). The comparison of non-parametric data was performed with the Mann-Whitney and Kruskal Wallis tests. Additionally, logistic regression models were used to assess which variables influenced postoperative nausea and / or vomiting. The level of statistical significance adopted for all tests was 5% ( $p < 0.05$ ).

## III. RESULTS

The sample of this study consisted of 200 patients with a mean age of 33 years ( $\pm 13.23$ ), 66% of whom were male. Episodes of PONV were recorded in 9% of cases, with 100% of them occurring in the first 12 postoperative hours.

The most frequent reason for surgery was trauma, with 100 cases (50% of the total sample), followed by orthognathic surgery with 40 cases (20%), maxillary pathologies in 26 cases (13%) and surgically assisted rapid maxillary expansion (SARME) (9%).

Patient age did not appear to interfere in PONV occurrence (Table 6). We also found statistical significance regarding smoking in which non-smoking patients corresponded to 66.66% of the patients with PONV episodes. In the non-smoking group 12 patients had PONV, whereas 6 patients in the smoker group reported PONV.

Considering the intubation method, 122 patients were under nasotracheal intubation and 78 under orotracheal intubation. All patients who presented PONV were in the group under nasotracheal intubation.

Regarding surgical access, all patients who reported PONV (18 cases) were submitted to intra oral access. Blood loss at surgery was higher in patients with PONV, with an average of 114 ml, whereas patients who did not present emetic events lost an average of 78 ml of blood during operation.

A significant difference was detected for PONV when comparing intubation method (table 1), type of surgical access (table 2), duration of the surgical procedure (table 3), and blood loss during surgery (table 4).

**Table 1:** Average Weight of Patients Who Experienced or Did Not Experience PONV (Postoperative Nausea and Vomiting)

PONV within 24h	
Total	No
Weight $65 \pm 0.08$	$70 \pm 0.08$

\* $p < 0.05$ , aChi-square or Fisher's exact test (n, %); bANOVA/Tukey Test (mean  $\pm$  SD).

**Table 2:** Number of Patients who Experienced PONV in Relation to the Type of Intubation

Intubation Type	PONV within 24h	
	Total	No
Nasotracheal	196	178
Orotracheal	4	4

**Table 3:** Number of Patients who Experienced PONV in Relation to the Type of Surgery

Surgery Type	PONV within 24h	
	Total	No
Orthognathic Surgery	40	32
Impacted Teeth	16	14
Trauma	100	98
ERMAC	18	12
Pathology	26	26

**Table 4:** Number of Patients who Experienced PONV in Relation to the Type of Surgical Approach

Surgical Approach	PONV within 24h	
	Total	No
Intraoral	122	78
Extraoral	78	104

#### IV. DISCUSSION

The literature shows that the emetic events of PONV, although often neglected, are postoperative complications that can cause great harm to the patient. The incidence of these events is between 20 and 30% of all patients undergoing surgical procedures (11). In the present study, we observed a 9% incidence of PONV, with higher incidence in patients undergoing orthognathic surgery. This finding corroborates the study of Pleuvry (12) who demonstrated an association between orthognathic surgery and PONV events.

As observed in the present study and according to investigations published in the literature, PONV is not among the most recurrent complications in orthognathic surgery; however, it is described by patients as a being worse than postoperative pain. Moreover, emetic events could lead to discharge delay thereby increasing patient length of stay at the hospital (13).

Emetic events are quite recurrent in the literature, being especially associated with gynecological, abdominal and otological procedures (14). However, the lack of investigations concerning PONV in patients undergoing oral and maxillofacial surgery hinders the establishment of a standard prevention protocol for PONV. In the present study, we

observed that the highest percentage of PONV events was found in patients undergoing orthognathic surgery (8 cases), followed by SARME (6 cases), removal of impacted teeth (2 cases) and trauma (2 cases). Bhakta et al. found similar results to our findings with a higher prevalence of PONV in orthognathic surgeries (47%), followed by oral surgeries (41.7%) and oral pathologies (24.4%).

Other factors which can influence an increase emetic events are the patient's age and weight. In the present study, we observed that patients who exhibited PONV were, on average, 35 years old, whereas those who did not have PONV were, on average, 30 years old, which was statistically insignificant. This finding diverges from the reports by Lerman (15) who suggested age above 18 years as a protective factor against postoperative nausea and vomiting (15). The average weight was 70 kg for patients with PONV and 65 kg for those without. Kovac (16) found a higher incidence of nausea and vomiting in overweight patients in relation to their height. Conversely, some authors report that adipose tissue may serve as storage for some drugs because of their chemical characteristics. These drugs could eventually recirculate in the bloodstream and prevent episodes of late PONV from occurring.

The general health condition of the patient associated with harmful habits such as smoking is also described in the literature. However, some harmful habits such as chronic smoking or previous direct contact with smokers (passive smokers) could have a protective effect against PONV, as indicated by Apfel (9).

When assessing the intubation method, all patients with PONV episodes in our study were under nasotracheal intubation. Although the literature is not very clear on how the intubation method influences the occurrence of PONV, it is believed that oro-tracheal intubation stimulates the vagus nerve through the passage of the intubation tube close to the nerve bundle, which generates greater vagal stimulation and greater risk of nausea and vomiting (17). This was contrary to the findings of our study, in which we found a higher incidence of PONV in patients whose intubation method was nasotracheal.

Another factor observed in our study, which may be related to the increase in the amount of blood in the oral cavity during surgery, is the intraoral access. In our study, all patients with PONV underwent surgical procedures through intraoral access. A common factor in all surgeries performed in the oral cavity is the presence of blood, which can be swallowed by the patient and act as an irritant to the gastric mucosa. Therefore, nausea and vomiting events become more frequent, as there is emesis stimulation via the vagus nerve (18). This is in accordance with what we found in our study, where patients with the highest PONV rates

lost about 114 ml of blood on average, well above the average of 78 ml in those without episodes of PONV.

Studies have attempted to predict and anticipate risk factors of PONV, and the most used prediction model is the one proposed by Apfel (9). This model is based on 4 risk factors: female sex, non-smoking status, history of motion sickness or PONV, and the application of postoperative opioids. PONV incidence should be at 10%, 21%, 61% and 79%, respectively, if 1, 2, 3 or 4 risk factors are present. The prediction scores by Apfel and collaborators are easy to apply, presenting reasonable predictability of PONV. Many authors, however, criticize this model, which prevents it from being used as a gold standard in the identification of patients possibly prone to this complication. In the present investigation, we observed that the Apfel's model was accurate in only one aspect: gender (10 of the 18 patients with PONV were female). The other factors did not meet the prediction of the model proposed by Apfel and collaborators. (2005).

## V. CONCLUSION

Non-smoking patients who underwent surgery via intraoral access lasting 3 hours or longer and with greater blood loss showed greater propensity for PONV episodes. It is of fundamental importance to be aware of the patient's profile and the characteristics of the selected surgical procedure to plan strategies to prevent PONV episodes. The establishment of an accurate and reliable PONV prediction and prevention protocol requires further investigations focused on the field of oral and maxillofacial surgery.

*Conflict of interest:* none.

*Financial support:* self-financed.

## REFERENCES RÉFÉRENCES REFERENCIAS

1. Gan T, Sloan F, Dear Gde L, et al. How much are patients willing to pay to avoid postoperative nausea and vomiting? *Anesth Analg*, 92, 2, 393-400, 2001.
2. Pleuvry BJ. Physiology and pharmacology of nausea and vomiting. *Anaesthesia & Intensive Care Medicine*, 13, 12, 598-602, 2012.
3. Guideline for the management of postoperative nausea and vomiting. McCracken G, Houston P, Lefebvre G; Society of Obstetricians and Gynecologists of Canada. *J Obstet Gynaecol Can*. 2008 Jul; 30(7):600-7, 608-16. doi: 10.1016/s1701-2163(16)32895-x.
4. Kovac AL. Prophylaxis of postoperative nausea and vomiting: controversies in the use of serotonin 5-hydroxytryptamine subtype 3 receptor antagonists. *J Clin Anesth*, 18, 4, 304-18, 2006.
5. Habib AS, Gan TJ. Evidence-Based Update and Controversies in the Treatment and Prevention of Postoperative Nausea and Vomiting. *Advances in Anesthesia*, 27,1,143-65, 2009.
6. Bhakta P, Ghosh BR, Singh U, Govind PS, Gupta A, Kapoor KS, et al. Incidence of postoperative nausea and vomiting following gynecological laparoscopy: A comparison of standard anesthetic technique and propofol infusion. *Acta Anaesthesiol Taiwan*, 54(4): 108-13, 2016.
7. Matsuura H, Inoue S, Kawagucji M. The risk of postoperative nausea and vomiting between surgical patients received propofol and sevoflurane anesthesia: A matched study. *Acta Anaesthesiol Taiwan*, 54:114-120, 2016.
8. Ziemann-Gimmel, P, Hensel, P, Koppman, J, and Marema, R. Multimodal analgesia reduces narcotic requirements and antiemetic rescue medication in laparoscopic Roux-en-Y gastric bypass surgery. *Surg Obes Relat Dis*. 2013.
9. Apfel CC, Stoecklein K, Lipfert P. PONV: a problem of inhalational anaesthesia? *Best Pract Res Clin Anaesthesiol*, 19, 3, 485-500, 2005.
10. Thomas R. The effect of smoking on postoperative nausea and vomiting. *Anaesthesia*, 55,10,1032-3, 2000.
11. Watcha MF. Postoperative nausea and emesis. *Anesthesiol Clin North America*, 20,3,709-22, 2002.
12. Pleuvry BJ. Physiology and pharmacology of nausea and vomiting. *Anaesthesia & Intensive Care Medicine*, 13,12,598-602, 2012.
13. Gondim CRN, Japiassú AM, Portari Filho PE, et al. Prevenção e tratamento de náuseas e vômitos no período pós-operatório. *Revista Brasileira de Terapia Intensiva*, 21,89-95, 2009.
14. Keyes M. Management of postoperative nausea and vomiting in ambulatory surgery: the big little problem. *Clin Plast Surg*, 40,3,447-52, 2013.
15. Lerman J. Surgical and patient factors involved in postoperative nausea and vomiting. *Br J Anaesth*, 69, 7 Suppl 1, 24s-32s, 1992.
16. Kovac AL. The prophylactic treatment of postoperative nausea and vomiting in oral and maxillofacial surgery. *J Oral Maxillofac Surg*, 63,10,1531-5, 2005.
17. Cruthirds D, Sims PJ, Louis PJ. Review and recommendations for the prevention, management, and treatment of postoperative and postdischarge nausea and vomiting. *Oral Surg Oral Med Oral Pathol Oral Radiol*, 115, 5, 601-11, 2013.
18. Piper SN, Rohm K, Boldt J, et al. Postoperative nausea and vomiting after surgery for prognathism: not only a question of patients' comfort. A placebo-controlled comparison of dolasetron and droperidol. *J Craniomaxillofac Surg*, 36, 3, 173-9, 2008.