Distribution frequency of Post Odontectomy Complications under General Anesthesia in Universitas Padjadjaran Dental and Oral Hospital (RSGM Unpad) Bandung

Arina Al Khaq[1], Endang Sjamsudin[1*], Abel Tasman Yuza[1]

[1]Department of Oral and Maxillofacial Surgery, Faculty of Dentistry Universitas Padjadjaran, Indonesia

ABSTRACT

Introduction: Odontectomy is a surgical procedure to remove an impacted tooth. Some cases of odontectomy are performed under general anesthesia because it has risks and complications that need to be considered, such as a patient with mental or physical disorder, difficulty level of the impacted tooth, number of impacted teeth extracted, and operative duration. This study aimed to determine the distribution frequency of post-odontectomy complications under general anesthesia in Universitas Padjadjaran Dental and Oral Hospital (RSGM Unpad), Bandung. **Methods:** This study was a cross-sectional descriptive study using retrospective data of medical records of a patient who underwent odontectomy under general anesthesia from 2017 until 2018 in RSGM Unpad. Samples were taken using a purposive non-probability sampling technique by setting inclusion criteria such as undamaged medical records and providing patient data on the first and a week control visit. The variables, including age, gender, classification of impacted teeth, number of teeth, and complications, were assessed in this study. The minimum sample size was determined by using the Slovin formula. The minimum sample required is 94% - 95% confidence level and 5% margin of error. **Results:** The data that had been collected shows that the number of female patients (67%), male patients (37%), the most common age was 21-30 years (52%), and odontectomy in 4 third molars (73%). Odontectomy that performed on four third molars (73%) with the ordinary post odontectocmy complications found in the female patient, such as trismus (2%), prolonged pain (7%), edema (3%), paraesthesia (3%). **Conclusion:** Distribution frequency of post-odontectomy complications under general anesthesia in RSGM Universitas Padjadjaran Banding is relatively low.

Keywords: frequency; odontectomy; general anesthesia; complications; impacted tooth

p-ISSN: 1979-0201; e-ISSN: 2549-6212; Available from: http://jurnal.unpad.ac.id/pjd/article/view/43211
DOI: 10.24198/pjd.vol34no3.43211
Submission: Oct 06, 2021; Accepted: Nov 30, 2022; Published online: Nov 30, 2022

INTRODUCTION

An impacted tooth fails to erupt into the dental arch within the expected time period. The tooth becomes impacted because the adjacent teeth, dense overlying bone, excessive soft tissue, or a genetic abnormality that prevents eruption.[1] Recent study has shown that the eruption of third

Corresponding author: Endang Sjamsudin, Department of Oral and Maxillofacial Surgery, Faculty of Dentistry Universitas Padjadjaran, Indonesian. St. Sekeloa Selatan 1, Bandung, West Java, Indonesia. Phone: +6281-1225-4699;
Email: endang.sjamsudin@fkg.unpad.ac.id

molars, especially in the mandibular arch, is accompanied by complications such as repeated episodes of pericoronitis, irreversible caries of the second molar, periodontal lesions located distal to the second molar and follicular cysts of the third molar.[2] The surgical procedure of removing the impacted tooth is known as odontectomy.[3] Odontectomy or surgical extraction is the removal of a tooth from the dental alveolus (socket) by making an incision (flap) and doing bone reduction around the tooth.[1]

The odontectomy procedure has risks and complications. Risk is a situation that is predicted to occur after a treatment procedure is performed. At the same time, complication is an unwanted situations in medical practice caused by several factors, such as errors committed by the operators and the patient's condition.[4]

Complications can arise during surgery, called perioperative complications and post-surgical or postoperative complications.[5] Post-odontectomy complications can be immediate complications like bleeding, edema, and pain. It can also be considered a complication if it occurs excessively or for extended periods. Other complications include trismus, paresthesia, dry socket, and infection.[6] Proper surgical technique and preoperative evaluation in the post-surgical behavior prevent complications.[7]

The surgical technique includes selecting the type of anesthetic for the patient's pain management.[7] Odontectomy can be performed using local anesthesia or general anesthesia. General anesthesia is chosen as pain management for odontectomy by considering anesthetics' anatomy, physiology, and pharmacology.[8] Important factors that must be considered relating to an odontectomy performed under a general anesthetic, according to a study of Universitas Airlangga Hospital, Surabaya, included: anxiety, patients with mental disorders, and adequate pain control.[9] According to Malamed et al[10], in his book Sedation: a Guide to Patient Management, postoperative complications are more familiar with general anesthesia than local anesthesia.

This statement is also supported by the results of a study regarding the complications of odontectomy under general anesthesia in 534 odontectomy patients who showed differences in the incidence of post-odontectomy nerve disorders using local anesthesia and general anesthesia.[11] Studies conducted by Fulvia Costantinides et al[11], showed that 6.7% had injury of nerve inferior alveolar nerve and lingual nerve after third molar surgery under general anesthesia and 0.3% with local anesthesia. Another study by Guerrouani et al[12], in 2013 showed no correlation found between the type of anesthesia and the complications that occurred.

Differences in the results of previous studies on the post odontectomy complications under general anesthesia and the limited research data on similar topics in Indonesia made the authors interested and aim to determine distribution frequency of post-odontectomy complications under general anesthesia at the Universitas Padjadjaran Dental and Oral Hospital in Bandung.

METHODS

This study was a cross-sectional descriptive study using retrospective data. The study population was the medical records of odontectomy patients under general anesthesia at Universitas Padjadjaran Dental and Oral Hospital in Bandung, from January 2017 to December 2018. The sample used a purposive non-probability sampling technique that involves selecting specific criteria. Inclusion criteria were undamaged and readable medical records, complete and confirmable data in patient gender, age, the number of third molars treated, and patient complaints. Exclusion criteria were medical records that did not have historical data at the time of the procedure and the seventh day of post-odontectomy.

The author recorded the patient's medical record data. Information about a medical record number, gender, age, number of third molars treated, patient complaints, and results of clinical examinations on the 1st and the seventh day of post-odontectomy. Patient complaints and clinical examination results followed by complications such as post-operative pain, edema, trismus, paresthesia, and dry socket. The study was processed using descriptive statistics with Microsoft Excel.

The study was conducted based on ethical approval from the Universitas Padjadjaran Research Ethics Commission Number 1256/UN.6KEP/EC/2019 as of October 16, 2019.

Sampling was carried out in November 2019 at the Universitas Padjadjaran Dental and Oral Hospital, Bandung. Medical records that fit the criteria as a sample were 122.

RESULTS

The study was conducted on 122 medical records of odontectomy patients under general anesthesia. Table 1 shows the distribution of patients categorized by gender, age, and the number of third molars treated.

There were 82 female patients (67%) and more than 40 male patients (33%). The distribution of patients based on age was mainly from the age group of 21 to 30 years, with 63 patients (52%), and the least from the age group >40 years, with 11 patients (9%). Eighty-nine samples (73%) in this study underwent odontectomy for their four wisdom teeth.

Table 1. Distribution of study samples

Category	Precentage		Total
Gender	Female	82 (67%)	122 (100%)
	Male	40 (33%)	
Age	<20 years	30 (25%)	122 (100%)
	21 - 30 years	63 (52%)	
	31 - 40 years	18 (15%)	
	> 40 years	11(9%)	
Number of 3rd molars	1	4 (3%)	122 (100%)
	2	16 (13%)	
	3	13 (11%)	
	4	89 (73%)	

Based on the results in table 2, 47 patients (39%) still felt the pain, edema, bleeding, and paresthesia be accompanied by edema on the first-day post odontectomy. The patients with complications on the seventh day were 23 (19%), 13 of the 23 were advanced cases from the first day, while the other ten were new. Complications include pain, edema, prolonged bleeding, trismus, paresthesia, and a combination. Pain is the most common risk and complication of this study.

Table 2. Distribution frequency of post-odontectomy complications under general anesthesia based on days

Variable	Day-1		Day-7	
	n	%	n	%
Pain	14	11%	8	7%
edema	12	10%	4	3%
Bleeding	0	0%	1	1%
Trismus	0	0%	0	0%
Paresthesia	0	0%	4	3%
Dry Socket	0	0%	0	0%
Pain + edema	14	11%	0	0%
Pain + Bleeding	2	2%	0	0%
Pain + edema + Bleeding	3	2%	0	0%
edema + Paresthesia	2	2%	1	1%
Pain + Trismus	0	0%	3	2%
Pain + edema + Trismus	0	0%	2	2%
No Complaints	75	61%	99	81%
Total	**122**	**100%**	**122**	**100%**

The distribution of post-odontectomy complications under general anesthesia based on gender, age, and the number of third molars is described in table 3. In general, the most common

post-odontectomy complications in this study were found in the female group, age group 21-30 years, and the group with four third molars was treated. Female patients only experience paresthesia.

Table 2. Distribution frequency of complications post odontectomy under general anesthesia based on gender, age, and number of teeth were treated

Variable	Day of post odontectomy	Gender		Age				Number of teeth			
	H+7	F	M	I	II	III	IV	1	2	3	4
Pain	8 (7%)	6 (7%)	2 (5%)	2 (7%)	2 (3%)	3 (15%)	1 (9%)	0 (0%)	2 (13%)	1 (7%)	5 (6%)
edema	4 (3%)	2 (2%)	2 (5%)	1 (3%)	2 (3%)	0 (0%)	1 (9%)	0 (0%)	1 (6%)	0 (0%)	3 (3%)
Bleeding	1 (1%)	1 (1%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)
Trismus	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Paresthesia	4 (3%)	4 (5%)	0 (0%)	1 (3%)	3 (4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)	3 (3%)
Dry socket	0 (0%)	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Pain + trismus	3 (2%)	2 (2%)	1 (1%)	1 (3%)	1 (2%)	1 (6%)	0 (0%)	0 (0%)	1 (6%)	0 (0%)	2 (2%)
Pain + edema + trismus	2 (2%)	2 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (6%)	1 (9%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)
edema + Paresthesia	1 (1%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)
Total	**23 (19%)**	**18 (21%)**	**5 (13%)**	**5 (16%)**	**9 (14%)**	**6 (33%)**	**3 (25%)**	**1 (25%)**	**4 (25%)**	**2 (24%)**	**16 (17%)**

Description :
F = Female; M = Male; I = Age group <20 years; II = Age group 21 – 30 years; III = Age group 31 – 40 years; IV = Age group >40 years

DISCUSSION

Pain, edema, bleeding, and a combination of the three that was complained by 47 patients on the first-day post odontectomy were not classified as complications but as risks or sequelae of odontectomy procedures related to wound healing and inflammation. Wound healing is divided into three phases: inflammatory, proliferative, and remodeling.[13] Inflammatory phase occurs 24 hours postoperatively to three days.[13] Incidence rate than male patients.[15,16] Nakagawa Y explained in his study that female has a smaller mandibular than the male which can result in more susceptibility to complications. Other factors, such as differences in hormones between females and males, pain threshold, and differences in anxiety levels, also cause high sensitivity in female patients to pain stimuli.[18,19]

Table 3 also, the incidence of post-odontectomy complications and the number of third molars treated increased. Most complications occurred in patients with four molars who had odontectomy, precisely 40 patients. The length of odontectomy is a risk factor for complications; The more prolonged the surgery time, the higher the chance of complications.[20] Duration of odontectomy can be affected by the degree of impaction difficulty, the ability of the operator, and the number of teeth being treated.[6]

Paras Rahim et al[21], in his study, suggested that the procedure's duration and the wound's size from the removal of impacted teeth were closely related to increased incidence of trismus, edema, and pain.The comparison of the incidence of complications by age in this study (Table 3) was not much different, and the highest complication rate occurred in the age group 21-30 years. This result contradicts the literature, which states that the older age group has a higher risk of complications than the younger age group.[4,13]

When compared based on the number of subjects in each age group (Table 3), There is an increase in the percentage of complications that occur with age. In the age group < 20 years there were 5 (16%) of 30 patients had complications; age group 21-30 years, 9 (14%) of 63 patients had complications; age group 31-40 years, 6 (33%) of the 18 patients have complications, and in the age group over 40 years there were 3 (27%) of 11 patients have odontectomy complications. Pain and edema usually present on the first postoperative day,

and complications on the seventh postoperative day often occur in this study. A total of 8 patients (7%) still felt pain and edema on the seventh postoperative day. This number is less than the results of a study conducted by Hui Lim et al[22], which pain and edema occurred in 8.7% of post-odontectomy under local anesthesia and 14.3% of post-odontectomy under local anesthesia.[22]

The surgical process will cause an inflammatory process, which is a protective response caused by tissue damage involving changes in vascular, white blood cells, and inflammatory mediators.[23] Soft tissue injuries will stimulate the degranulation of white blood cells and the release of inflammatory mediators, such as histamine, prostaglandins, bradykinin, and leukotrienes.[20] Histamine and prostaglandins will affect vasodilation as the first response of inflammation.[20] Another vascular change from the inflammatory process is increased vascular permeability, characterized by gaps between endothelial cells that cause extravasation of plasma proteins.[23] Accumulation of plasma proteins in the extravascular space causes swelling or edema.[23]

Excessive tissue pressure due to edema causes nociceptive stimulation, resulting in aches or pain.[24] Postoperative pain also occurs due to inflammatory mediators that act as noxious stimuli.[23] The inflammatory mediator's bradykinin present in nociceptor activation are A delta nerve fibers and C nerve fibers, while prostaglandins cause sensitization of nociceptor endings in peripheral tissues. A delta nerve fibers are thinly myelinated and responsible for transmitting pain with a fast, spontaneous, localized, and sharp onset.[24]

In contrast, the C nerve fibers are unmyelinated, slower, and diffuse to induce pain. The mechanism for the occurrence of pain is called nociception that divided into four stages: transduction, transmission, modulation, and perception.[23] Transduction refers to the process by which noxious stimuli are converted to electrical impulses. Transmission channels impulses from peripheral nerve fibers to the central nervous system. Modulation is amplifying (pain-related neural signals); this process occurs in the dorsal horn of the spinal cord.

The result of modulation can be signal amplification or nociceptive signal inhibition. The last process is the perception of the interaction of transduction, transmission, modulation, psychological aspects, and the characteristics of each individual.[23] Non-steroidal anti-inflammatory drugs have a role in relieving pain due to postoperative nociceptor sensitization.[25]

Usually, the inflammatory process, characterized by pain and edema, will subside or disappear after 72 hours post-odontectomy. However, some complained of pain and edema on the seventh postoperative day. Pain and edema that occurs for three days after odontectomy are risks related to the wound healing process post-odontectomy, whereas pain that lasts until the seventh postoperative day was a complication of odontectomy due to impaired wound healing. Systemic and local factors can delay wound healing. Systemic factors include blood disorders, such as agranulocytosis and leukemia, and systemic diseases, such as diabetes mellitus, osteoporosis, and Paget's disease. Local factors involve infection, chronic inflammation, dry socket, malignant neoplasm, food impaction, and dislodged sutures.[4]

Bleeding can occur due to several local factors, such as infection, excessive trauma, and local vascular lesions. Bleeding can be called abnormal or excessive if the blood comes out continuously for more than 36-72 hours post-odontectomy.[13] Bleeding after the first day of surgery is a risk of odontectomy, while massive bleeding and bleeding on the seventh postoperative day are complications of odontectomy.[13] In this study (Table 2), one patient experienced prolonged bleeding (0.8%), following previous studies where prolonged bleeding complications occurred in 0.4 – 2.6% of odontectomy cases and most commonly occurred in the mandibular compared to the maxilla.[27] Prolonged bleeding due to blood clotting disorders, infection, family history of the disease, or consumption of certain drugs such as anticoagulants.[27]

Paresthesia is an abnormal sensation, such as a burning or numbness, that is felt due to trauma on a nerve. The inferior alveolar and lingual nerves are the most frequently traumatized post-odontectomy procedures.[13] Total of 4 patients (3%) in this study have paresthesia on the 7th post-odontectomy day (Table 2). This number is

higher than a previous study by Gulicher, which showed that injury of the inferior nerve alveolar occurred in 0.9% of 687 mandibular third molar odontectomy.[22] The occurrence of nerve injury be affected by several things, including the depth of the impacted tooth, the position of the mandibular third molar tooth to the mandibular canal, age, and the lack of operator experience.[28,29] Clinically, paresthesia of the inferior alveolar nerve can be described as persistent or temporary numbness in the corners of the mouth, lower lip, chin, inner mucosa of the lips, and labial gingiva. In contrast, paresthesia of the lingual nerve is described as a loss of taste sensation on the tongue in the gingival mucosa's dorsal or ventral and lingual part.[28,29]

In this study (Table 3), complications of paresthesia only occurred in female patients. This result follows a study by Tyler Kovisto et al[30], which stated that the distance between the mandibular canal and the roots of the molar teeth in females is closer than in males.[30] Another study by Nakagawa et al[17], showed that in females, it is more common to find the third molar root in contact with the mandibular canal compared to males.[17] Impacted third molar roots and mandibular canal affect the occurrence of paresthesia, the distance between the third molar roots and mandibular canal, the higher the risk of paresthesia.[17] There were paresthesia complications accompanied by edema in this study (Table 2). Edema can cause paresthesia due to edema as an indirect trauma that causes thinning of the myelin sheath. Depleting the myelin sheath induces conduction blockade, inhibiting the transmission of nerve impulses resulting in paresthesia.[29]

Trismus commonly occurs due to spasms of the masticatory muscles, which are characterized by an inability to open the mouth, difficulty speaking, and chewing be accompanied by pain.[16] Trismus occurs due to trauma during odontectomy procedures and opening the mouth for too long, so trismus is associated with lengthy surgical procedures.[31,32] In this study (Table 2), some patients complained of trismus, pain, and edema. Trismus is also caused by edema and pain due to the post-odontectomy inflammatory process. Osmani's opinion supports that edema around post-odontectomy wounds causes changes in the surrounding tissue so that the muscles of mastication have a spasm. Vriezen's study explains that inability to open the mouth after odontectomy occurs because of aches or pain.33 This study (Table 2) showed that trismus only occurs on the seventh postoperative day; this result is different from the results of another study conducted by Ra'ed Al-Delayme, which showed that trismus reached its highest level on the first postoperative day and decreased on the seventh postoperative day.[34] The presence of an infection that causes pain in the post-odontectomy wound can cause trismus, which is only found on the seventh postoperative day.[13]

This study (Table 2) shows no dry socket complications in odontectomy under general anesthesia at the Universitas Padjadjaran Dental and Oral Hospital in Bandung. A dry socket is a condition when the blood clot that protects the wound disintegrates or breaks loose, exposing the nerves and bone in the socket.[35] Post-odontectomy dry socket complication rates from 0.5% - 32.5%.[35] The incidence of dry sockets can be reduced by various techniques that reduce bacterial contamination of the surgical site. Preoperative irrigation using antimicrobial agents such as chlorhexidine can reduce the incidence of dry sockets by 50%.[16] Irrigation of surgical wounds with saline has also been shown to reduce the occurrence of dry sockets.[16]

The results of this study have not been able to prove whether there is a correlation between the use of general anesthesia and post-odontectomy complications. Further studies using different methods and statistical analysis are needed to determine whether general anesthesia affects post-odontectomy complications.

CONCLUSION

Distribution frequency of post-odontectomy complications under general anesthesia at Universitas Padjadjaran Dental Hospital in Bandung were relatively minimum. Most complications occur in females. The most common complications are pain, edema, bleeding, trismus, paraesthesia, or a combination of these five complications

REFERENCES

1. Hupp J, Tucker M, Ellis E. Contemporary Oral and Maxillofacial Surgery. 6th Ed. Missouri:

Elsevier; 2013. 160–84.
2. Passi D, Singh G, Dutta S, Srivastava D, Chandra L, Mishra S, Srivastava A, Dubey M. Study of pattern and prevalence of mandibular impacted third molar among Delhi-National Capital Region population with newer proposed classification of mandibular impacted third molar: A retrospective study. Natl J Maxillofac Surg. 2019; 10(1): 59-67. DOI: 10.4103/njms.NJMS_70_17.
3. Rayahu S. Odontektomi, tatalaksana gigi bungsu impaksi. E-Journal Widya Kesehatan dan Lingkungan. 2014; 1(1): 81-9. DOI: 10.5772/53400.
4. Brad N, Damm DD, Allen C, Chi A. Oral and Maxillofacial Pathology. 4th Ed. Philadelphia: Saunders; 2015. 121–201.
5. Ahana Goswami, Tanmoy Ghorui, Rajarshi Bandyopadhyay, Anupam Sarkar, Amit Ray. A General Overview of Post Extraction Complications-Prevention, Management and Importance of Post Extraction Advices. Fortune J Heal Sci. 3 (2020): 135-47.
6. Rakhshan V. Common risk factors for postoperative pain following the extraction of wisdom teeth. J Korean Assoc Oral Maxillofac Surg. 2015; 41(2): 59-65. DOI: 10.5125/jkaoms.2015.41.2.59.
7. Hupp JR, Ellis E, Tucker M. Contemporary Oral and Maxillofacial SUrgery. 7th Ed. Philadelphia: Elsevier; 2019. 160–84.
8. Bagheri SC. Clinical Review of Oral and Maxillofacial Surgery. 2nd Ed. Missouri: Elsevier; 2014. 134–7.
9. Rasyida AZ, Rizqiawan A. Considerations in performing odontectomy under general anesthesia: case series. Maj Ked Gig. 2018; 185(32): 185–8. DOI: 10.20473/j.djmkg.v51.i4.p185-188
10. Trieger, Malamed SF. Sedation: a Guide To Patient Management. 6th Ed. The J the American Dent Assoc. Missouri: Mosby; 2017. 779–95.
11. Costantinides F, Biasotto M, Maglione M, Di Lenarda R. Local vs general anaesthesia in the development of neurosensory disturbances after mandibular third molars extraction: A retrospective study of 534 cases. Med Oral Patol Oral Cir Bucal. 2016; 21(6): e724-e730. DOI: 10.4317/medoral.21238.
12. Guerrouani A, Zeinoun T, Vervaet C, Legrand W. A four-year monocentric study of the complications of third molars extractions under general anesthesia: About 2112 patients. Int J Dent. 2013; 2013. DOI: 10.1155/2013/763837.
13. Miloro M, Ghali G, Waite P. Peterson' s Principles of Oral and Maxillofacial Surgery - Third Edition. 3rd Ed. Peterson's 3rd Edition. 2012. 97–121.
14. Wiegand C, Wiegand C. Wound inflammation and the role of a multifunctional polymeric dressing. Wounds International. 2015; 6(2): 41–6.
15. Ahuja K, Pannu R, Pal N, Aggarwal N, Berwal V. Complications and Risk Factor Associated with Extraction of Impacted Third Molars : A Prospective Study. 2017; 2(4): 153–5.
16. Deliverska EG, Petkova M. Complications After Extraction of Impacted Third Molars - Literature Review. J IMAB - Annual Proceeding (Scientific Papers). 2016; 22(3):1202–11. DOI : 10.5272/jimab.2016223.1202.
17. Deshpande P, v. Guledgud M, Patil K. Proximity of Impacted Mandibular Third Molars to the Inferior Alveolar Canal and Its Radiographic Predictors: A Panoramic Radiographic Study. Journal of Maxillofacial and Oral Surgery. 2013; 12(2): 145–51. DOI: 10.1007/s12663-012-0409-z.
18. Casale R, Atzeni F, Bazzichi L, Beretta G, Costantini E, Sacerdote P, et al. Pain in Women: A Perspective Review on a Relevant Clinical Issue that Deserves Prioritization. Pain and Therapy . 2021; 10(1): 287–314. DOI: 10.1007/s40122-021-00244-1.
19. Bartley EJ, Fillingim RB. Sex differences in pain: a brief review of clinical and experimental findings. BJA: British J Anaesthesia. 2013; 111(1): 52. DOI: 10.1093/bja/aet127.
20. Bharat A, Gupta R, Singh A, Aggarwal R. Evaluation of risk factors predisposing to complications after mandibular third molar surgery. Int J Oral Health Dent. 2017; 3(1): 10–4. DOI: 10.18231/2395-499X .2017.0023
21. Baloch PR, Punjabi SK, Hamid S. Relationship between Operative Time and Complication for Impacted Third Molar Removal. J Liaquat University. 2019; 18(3): 219–24.
22. Lim HW, Mahmod NI, Zaki FHA, Tan FY, Balasundram S, Adnan TH. Wisdom Tooth

Surgery Complications—Local Anaesthesia versus General Anaesthesia. Open J Stomatology. 2019; 09(03): 51–63. DOI: 10.4236/ojst.2019.93006.
23. Mandell L. Constructing and deconstruction the gate theory of pain. 2014; 155(2): 210. DOI: 10.1016/j.pain.2013.12.010.
24. Araújo RZ, Pinto Júnior AAC, Sigua-Rodriguez EA, Olate S, Fonseca Alves LC, de Castro WH. Pain Control in Third Molar Surgery. Int J odontostomatology. 2016; 10(3): 385–91.
25. Pogatzki-Zahn EM, Segelcke D, Schug SA. Postoperative pain—from mechanisms to treatment. Pain Reports. 2017; 2(2). DOI: 10.1097/PR9.0000000000000588.
26. Kumbargere Nagraj S, Prashanti E, Aggarwal H, Lingappa A, Muthu MS, Kiran Kumar Krishanappa S, et al. Interventions for treating post-extraction bleeding. Vol. 2018, Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd; 2018. DOI: 10.1002/14651858.CD011930.pub3.
27. Kumbargere Nagraj S, Prashanti E, Aggarwal H, Lingappa A, Muthu MS, Kiran Kumar Krishanappa S, et al. Interventions for treating post-extraction bleeding. Vol. 2018, Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd; 2018. DOI: 10.1002/14651858.CD011930.pub3.
28. Meshram VS, Meshram PV, Lambade P. Assessment of Nerve Injuries after Surgical Removal of Mandibular Third Molar: A Prospective Study. Asian J Neuroscience. 2013; 2013: 1–6. DOI: 10.1155/2013/291926.
29. Sharif-Alhoseini M, Rahimi-Movaghar VRA. Underlying Causes of Parestesia. Parestesia. 2012; (February). DOI: 10.5772/32360
30. Kovisto T, Ahmad M, Bowles WR. Proximity of the mandibular canal to the tooth apex. J Endodontics. 2011; 37(3): 311–5.
31. Balakrishnan G, Narendar R, Kavin T, Venkataraman S, Gokulanathan S. Incidence of Trismus in Transalveolar Extraction of Lower Third Molar. J Pharmacy & Bioallied Sciences. 2017; 9(Suppl 1): S222. DOI: 10.4103/jpbs.JPBS_161_17.
32. Zhang Y, Zhuang P, Jia B, Xu J, Cui Q, Nie L, Wang Z and Zhang Z: Persistent trismus following mandibular third molar extraction and its management: A case report and literature review. World Acad Sci J. 2021; 3: 2. DOI: 10.3892/wasj.2020.73
33. Fakhrurrazi, Hakim RF, Rifani R. Hubungan Tingkat Kesulitan Dengan Komplikasi Post Odontektomi Gigi Impaksi Molar Ketiga Rahang Bawah Pada Pasien Di Instalasi Gigi Dan Mulut Rsudza Banda Aceh. Cakradonya Dent J. 2015; 7(1): 745–806.
34. Al-Delayme R, Alsafi M, Aun W, Kadeem A. Factors Associated with Trismus Severity Following Impacted Lower Third Molar Surgery: A Prospective Study. Indian Journal of Dental Advancements. 2013; 5(1): 1100–6. DOI: 10.5866/2013.511100
35. Andersson L, Kahnberg K-E, Pogrel AM. Essentials of Oral and Maxillofacial Surgery. 1st Ed. The British J Psychiatry. Oxford: Wiley Blackwell; 2014.