International Journal of Dental Research
www.dentaljournal.net
Online ISSN: 2664-9055, Print ISSN: 2664-9047
Received: 28-04-2023, Accepted: 14-05-2023, Published: 29-05-2023
Volume 5, Issue 2, 2023, Page No. 22-26

A retrospective investigation examined the frequency of postoperative infection following tooth extraction

Saurabh Singh[1], Priya Sharma[2], Jyochchna Rani Sahoo[3]

[1] Reader, Department of Public Health Dentistry, RKDF Dental College and Research Centre, Madhya Pradesh, India

[2] Department of Oral and Maxillofacial Surgery, Rishiraj College of Dental Sciences and Research Centre Bhopal, Madhya Pradesh, India

[3] Post Graduate Student, Department of Public Health Dentistry, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India

Abstract

The goals of this research were to determine the incidence of postoperative infection following tooth extraction in a Department of Public Health Dentistry, and to pinpoint the elements linked to a higher risk for postoperative infection. An analysis of case files from patients who had their teeth removed over a six-year period at the Department of Public Health Dentistry, RKDF Dental College and Research Centre, Bhopal was done retrospectively. The case records were used to extract information on demographics, patient-related factors, and treatment-related factors. The odds ratio of a patient developing a postoperative infection or not was calculated using a binary logistic regression analysis and compared with each condition. Over the course of six years, 1821 extractions—both simple and complex—were carried out. The only thing that significantly influenced the likelihood of a postoperative infection following an extraction was the extraction's complexity; more difficult extractions were associated with greater infection rates (binary logistic regression, OR 2.03, p 0.004). The incidence of postoperative infection was not significantly influenced by any of the other variables, particularly the prescription of antibiotics. In Department, postoperative infection was uncommon following tooth extractions, and giving antibiotics provided no further benefit in preventing infection after surgery.

Keywords: postoperative infection, extraction, pericoronitis, periodontal problems

Introduction

In dental offices all throughout the world, tooth extraction is an ordinary procedure. Dental cavities, periodontal issues, and pericoronitis linked to impacted teeth are the leading causes of these extractions [1]. Nevertheless may be some postoperative problems with this common operation [2]. According to reports, one of the most common problems after wisdom tooth removals is infection, which may show up as swelling, pain, an abscess, a fever, or a dry socket [3]. A third molar extraction in young individuals who are physically healthy carries a 10% risk of postoperative infection, according to a Cochrane review of randomized controlled trials. Before to the extraction, the risk is raised in individuals with a poor immune system by up to 25% [4]. While some dentists prescribe antibiotics to prevent postoperative infections after tooth extractions, the matter continues to be controversial in clinical practice because there are a variety of factors that may contribute to patients developing an infection shortly after extraction. Some of the factors influencing the likelihood of infection during extraction include the use of antibiotics, the patient's gender, age, the presence of systemic disease, smoking, the complexity of the extraction, the length of the surgery, the method of surgery, and surgical expertise [5-8]. Studies on the effects of antibiotic use after extractions have produced conflicting findings, leaving the question of whether antibiotics are still necessary after extractions unresolved. While antibiotics have been reportedly found to be successful in preventing infections after third molar extractions in some studies [9–11], there are other studies that opposed the usage of antibiotics with the aim of preventing post-extraction infections [4, 12–18].

The effectiveness of several antibiotics in reducing the incidence of postoperative infections following third molar extractions has been documented, but there is no agreement on the best type of antibiotic to use or if prescribing antibiotics is necessary [19]. Additionally, the worldwide urgent problem of antibiotic resistance and the low infection rate (5%) following third molar procedures discourage the routine use of antibiotics if it is not required [11]. Dental professionals can use a more evidence-based strategy in their practice by having a thorough grasp of the role of antibiotics in the prevention of postoperative infection and the factors that contribute to infection.

Retrospective evaluations of adequately recorded health data have demonstrated to offer special benefits in discovering numerous outcomes, assessing outcomes with a low incidence, and cutting the cost and time of a study [20]. The six-year retrospective follow-up analysis of patient case files who had their teeth extracted was part of the current study. The Department of Public Health Dentistry, RKDF Dental College and Research Centre, Bhopal set out to determine the frequency of postoperative infection following tooth extractions carried out between January 1, 2016, and May 31, 2022. The goal was to estimate the incidence of postoperative infection and to identify the factors associated with an increased incidence of postoperative infection.

Methodology

All patients who had tooth extractions at the Department of Public Health Dentistry, RKDF Dental College and Research Centre, Bhopal, between January 1, 2016, and May 31, 2022, were included in the retrospective review of case data. The following dental extraction treatment codes were used in all case reports that were recorded in the clinic's electronic health record system (OPENDENT) as tooth extractions: EXTR001, EXTR002, EXTR003, EXTR005, EXTR007, EXTR008, and D7140. Both dental professionals and dental students' extractions were considered.

Every record created with the following treatment codes between January 1, 2016, and May 31, 2022 were examined in the study to determine the postoperative infection rate: EXTR001, which stands for basic extraction of incisors and canines; EXTR002, which stands for basic extraction of premolars; EXTR003, which stands for basic extraction of molars; EXTR005, which stands for complex extraction involving a surgical extraction; EXTR007, which stands for complex extraction including a such as deep impaction, and D7140 as extraction of an erupted tooth or exposed root.

After locating the case files using the treatment codes in OPENDENT, as we've already mentioned, two investigators independently collected data. The patient's age (as of the extraction day), gender, the type of operator used, the complexity of the extraction, the type of antibiotic prescribed and administered, the type of postoperative infection (if any), and the reason given for the extraction were all taken from the case documents. By evaluating the entries of the two investigators and correcting any discrepancies through discussion and agreement on the coding, inter-operator agreement on the coding for the indication of extractions was evaluated.

Additionally, several groups were created from the indications for extractions (Table 1). Clinical signs of postoperative infection included purulent discharge from the socket, discomfort coupled with swelling, and escalating local swelling with or without suppuration. The National Antibiotic Guideline was followed for prescribing antibiotics at IMU-OHC. Also noted were patients who additional care because of recurrent infection or ongoing inflammation. All records of extraction within the specified time frame were chosen, although any missed data were also recorded. Therefore, the records' data were examined. The odds ratio for postoperative infection was compared before and after confounding factors were taken into account using binary logistic regression analysis with the function "glm ()" in R Version 4.1.0. As the dependent variable, the binary outcomes of infection (1), and absence of infection (0), were used. Statistics were deemed significant at p 0.05. Age, sex, intricacy, operator, extraction indication, and antibiotic prescription were the independent variables.

Results

From January 1, 2016, to May 31, 2022 a total of 1821 patient cases that were categorised under different extraction treatment codes in the departments electronic health record system (OPENDENT) were examined. Table 2 lists the total patients who had extractions, the proportion of patients who had and did not have postoperative infection, and the factors that may have an impact on whether or not postoperative infection occurs following extractions. In addition, as shown in Table 3, pain with swelling (12 instances) and discomfort with 11 cases but only 2 cases of rising local swelling with suppuration were the most frequent postoperative infections in the patients. Other surgical infection forms, as identified in our investigation, such as purulent discharge and growing local edema without suppuration, were not observed. Table 4 provides a description of the prescription antibiotics. The outcomes of the binomial logistic regression analysis are shown in Table 5 (Table 5). Only one of the variables for which data were extracted—the "complexity of extractions" factor—was significantly linked to a higher probability of postoperative infection (binomial logistic regression, OR 2.03, p 0.004). A simple extraction reduced the log odds for a postoperative infection by 2.03 times as compared to a complex extraction. None of the other factors had a significant influence on the odds of having a postoperative infection after extraction.

Table 1: Indications for tooth extraction

Category	Description
Periodontal disease (PD)	Teeth extracted due to poor periodontal prognosis
Pericoronitis (PC)	Teeth extracted due to inflammation of the gingiva surrounding the crown of partially erupted tooth
Pupal Pathology (C)	Teeth extracted due to pulpal pathology as a sequela of dental caries, such as irreversible pulpitis, apical periodontitis, and apical abscess
Orthodontic reasons (O)	Teeth extracted for fixed or removable orthodontic therapy
Adjacent tooth pathology (A)	Extraction of asymptomatic teeth due to dental caries, food impaction, periodontal disease, on an adjacent tooth
Elective extractions (E)	Extractions of asymptomatic teeth that were performed due to fear of future complications; such as an impacted third molar that may cause future pathological problems to an adjacent tooth
Retained deciduous teeth (D)	Extraction of asymptomatic deciduous teeth
Others (ox)	Extractions that cannot be categorized any other categories such as removal of supernumerary teeth or vertical tooth fracture, prosthodontic extractions of supra-erupted or severely tilted teeth, and removal of teeth as a result of dental trauma

Table 2: Patient and treatment variables showing the number of infection cases reported for each variable.

Variable	Total	Infection	No infection
Teeth	1821	25	1796
Age			
<30	314	11	303
30–60	968	12	956
>60	539	2	537
Sex			

Female	941	13	928
Male	880	12	868
Indication			
Periodontal	586	4	582
Pericoronitis	15	2	13
Pulpal pathology	521	7	514
Orthodontics	33	1	32
Adjacent tooth pathology	17	0	17
Fear of future complication	158	8	150
Deciduous	11	0	11
Others	480	3	477
Operator			
Student	1675	22	1653
Dental surgeon	146	3	143
Medical History			
No relevant history	1487	21	1466
Hypertension/diabetes/heart	334	4	330
Complexity			
Simple	1594	12	1582
Complex	227	13	214
Antibiotics			
No	1592	17	1575
Yes	229	8	221

Table 3: The types of postoperative infection for the 25 postoperative infection cases.

Types of postoperative infection	No. of cases
Increasing local swelling with suppuration	**2**
Pain	11
Pain with swelling	12

Table 4: Antibiotics prescribed for tooth extraction.

Types of antibiotics	Total	Infection	No Infection
Amoxicillin	141	5	136
Amoxicillin + metronidazole	36	2	34
Augmentin	24	0	24
Metronidazole	12	0	12
Others	16	1	15

Table 5: Binomial logistic regression with postoperative infection as the dependent variable.

Variable	Estimate	Standard Error	Z Value	P value
Sex (M)	4.12	166*e* + 01	0.099	0.921
Age (>60)	9.36	9.320 + 01	1.005	0.314
Age (30–60)	2.02	5.549 + 01	0.037	0.970
Complexity (si)	2.03	7.134 + 01	2.848	0.004∗
Operator (S)	4.59	6.841 + 01	0.671	0.502
Indication (C)	1.44	1.524 + 03	0.010	0.992
Indication (D)	1.42	2.486 + 03	0.000	0.999
Indication (E)	1.42	1.524 + 03	0.009	0.992
Indication (O)	1.51	1.524 + 03	0.010	0.992
Indication (OX)	1.40	1.524 + 03	0.009	0.992
Indication (PC)	1.59	1.524 + 03	0.010	0.991
Indication (PD)	1.44	1.524 + 03	0.009	0.992
Antibiotics	2.77	5.473 + 01	0.507	0.612

Discussion

Thirteen cases came from difficult extractions, compared to twelve cases from simple extractions. This is in line with aprospective research that found that routine extractions of erupted teeth have a low rate of post-operative infection, such as infection in the alveolar bone, dry socket, and postoperative discomfort [21]. The infection rates following third molar extractions were also reported to be low in a recent 5-year retrospective research [11]. Nevertheless, 66.8% of the total number of extraction patient cases—or more than half—did not have any records of follow-up visits. As a result, it's probable that some of these patients developed postoperative infections but chose not to visit the hospital for care. The need for antibiotic prescriptions for the goal of preventing infection after tooth extractions is debatable, however, given the generally low rates of postoperative infection following tooth extractions in both our study and previous published studies.

Only 12.4% of the patients received an antibiotic prescription following a dental extraction, indicating that this is not a common practise there. Additionally, just 1% of the patients who did not receive an antibiotic prescription experienced a postoperative infection, compared to 3.6% of the patients who did receive an antibiotic prescriptions. Since antibiotics have only a little impact on infection risk, numerous studies do not advise using them to avoid postoperative infections following extractions [4, 12–18]. Following third molar extractions, antibiotic use has been successful in preventing postoperative infections, but [9, 10]. The recommendation of antibiotics after extractions is still debatable, however, given the overall low incidence of postoperative infection in the research we conducted (1.4%), the relatively low rate of postoperative infection without an antibiotic prescription (1%), and the frequency of infection shortly after extraction regardless of an antibiotic prescription (3.6%).

Antibiotic resistance is a global issue that poses a threat to the prevention and treatment of a variety of illnesses, so it is important to use antibiotics with caution [11]. Amoxicillin was the most often administered antibiotic in our study, given to 61.6% of the patients who got antibiotics following extraction. Eight patients received antibiotic treatment but still developed a postoperative infection; each of them were given amoxicillin or one of its combinations; five received amoxicillin, two received amoxicillin plus metronidazole, and one received preventive amoxicillin. The common usage of amoxicillin demonstrates the preference for dentists to prescribe this antibiotic for preventing postoperative in- fections after extractions [11, 22–27]. However, a recent study reported the ineffectiveness of frequently used anti- biotics such as amoxicillin in the

prevention of postoperative infections after extractions, possibly due to antibiotic resistance [11].

The incidence of postoperative infection was 3.5% for patients under the age of 30, 1.2% for patients aged 30 to 60, and 0.4% for patients over 60. Patients under the age of 30 had the greatest prevalence of postoperative infection. This runs counter to earlier clinical study, which found that older age and more comorbid conditions raise the likelihood of problems following extractions [28]. The peak age range for a higher incidence of dry socket, according to certain studies, is roughly 20 to 40 years of age [29]. This might be because young individuals are typically the ones who undergo third molar extraction operations.

In the 25 instances that had a postoperative infection, dental students handled 22 (88%) while dentists handled only 3 (12%) and oral surgeons handled none of the cases. Students' procedures could take longer than those performed by dentists and oral surgeons, indirectly raising the risk of infection following extraction. One key risk factor for the incidence of postoperative problems during oral surgery is recognised to be longer operational duration [30].

The most common cause of postoperative infection (13.3%) was extraction because of pericoronitis. This can be because there was already an infection present before the extraction. A greater likelihood of postoperative inflammatory problems after third molar operations has been linked to preexisting infection and pathology [13, 28]. In the present investigation, we also discovered that the incidence of postoperative infection was nearly comparable for both genders. But according to earlier studies, women are eight times more likely than males to get a dry socket [31]. Additionally, the incidence of postoperative infections was identical in both healthy and sick patients, including those with diabetes or hypertension. We took into account the possibility that the medically precarious patients in our investigation had their circumstances pursuant to regulate on the day of their extraction, presenting as complication-free throughout their review being appointed, even though significant medical history has been shown to increase the risk of infection [13, 29].

Only one of the parameters for which data were extracted—the "complexity of extractions" factor—was significantly linked to an elevated risk of postoperative infection (OR 2.03, p 0.004). Age, sex, operator, and the justification for the extraction or antibiotic therapy were the only other variables for which we could find no statistically significant relationship with the prevalence of postoperative infection ($p > 0.05$). This might be as a result of the procedure's increased complexity, which includes the requirement for a flap incision, bone removal, and tooth sectioning. According to several studies [5, 32–34], longer procedures typically result in more painful sockets. However, other studies reported that only the factor of age was significant, in which the occurrence of infection after dental extractions was highest in older patients [11, 35]. This contrast may be due to the difference in the parameter of the types of extraction analyzed, in which our study covered all types of extractions, whereas the 2016 study only focused on third molar surgeries (complex extractions).

Conclusion

The rate of postoperative infection following tooth extractions was determined to be minimal (1.4%) in this 6-year retrospective case record analysis, and there was no discernible benefit to administering antibiotics for the prevention of postoperative infection after tooth extractions. Additionally, only the complexity of the extraction was found to have a significant influence on the incidence of postoperative infection following dental extractions among the factors examined in this study. Dental doctors should use caution when prescribing antibiotics in light of the problem of antibiotic resistance. If antibiotics are necessary, they should be wisely chosen using a method based on evidence.

References

1. Chiapasco M, De Cicco L, Marrone G. “Side effects and complications associated with third molar surgery,” Oral Surgery, Oral Medicine, Oral Pathology,1993:76(4):412–420.
2. Lopes V, Mumenya R, Feinmann C, Harris M. “Third molar surgery: an audit of the indications for surgery, post- operative complaints and patient satisfaction,” British Journal of Oral and Maxillofacial Surgery,1995:33(1):3–35.
3. Bouloux GF, Steed MB, Perciaccante VJ. “Complications of third molar surgery,” Oral and Maxillofacial Surgery Clinics of North America,2007:19(1):117–128.
4. Lodi G, Figini G, Sardella G, Carrassi A, Del Fabbro M, Furness S. “Antibiotics to prevent complications following tooth extractions,” The Cochrane Database of Systematic Reviews, Article ID Cd003811, 2012, 11.
5. Pedersen, “Interrelation of complaints after removal of impacted mandibular third molars,” International Journal of Oral Surgery,1985:14(3):241–244.
6. Capuzzi P, Montebugnoli L, Vaccaro MA, “Extraction of impacted third molars,” Oral Surgery, Oral Medicine, Oral Pathology,1994:77(4):341–343.
7. Benediktsdo´ttir S, Wenzel A, Petersen JK, Hintze H. “Mandibular third molar removal: risk indicators for ex- tended operation time, postoperative pain, and complica- tions,” Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology,2004:97(4):38–446.
8. Lu Y P. Gong Y, Chen W Cai, Sheng J. “Safety analysis of tooth extraction in elderly patients with cardiovascular diseases,” Medical Science Monitor: International Medical Journal of Experimental and Clinical Research,2014:20:782–788.
9. Ren YF, Malmstrom HS. “Effectiveness of antibiotic prophylaxis in third molar surgery: a meta-analysis of ran- domized controlled clinical trials,” Journal of Oral and Maxillofacial Surgery,2007:65(10):1909–1921.
10. Lang MS, Gonzalez ML, Dodson TB. “Do antibiotics decrease the risk of inflammatory complications after third molar removal in community practices?” Journal of Oral and Maxillofacial Surgery,2017:75(2):249–255.
11. Menon RK, Gopinath D, KY Li, Leung YY, Botelho MG. “Does the use of amoxicillin/amoxicillin-clavulanic acid in third molar surgery reduce the risk of postoperative infection? A systematic review with meta- analysis,” International Journal of Oral and Maxillofacial Surgery,2019:48(2):263–273.
12. Monaco G, Staffolani C, Gatto MR, Checchi L. “Antibiotic therapy in impacted third molar surgery,” Eu- ropean Journal of Oral Sciences,1999:107(6):437–441.

13. Radfar L, Settle S, Movaffagh Y, Masood F. “Antibiotic prophylaxis: a literature review,” Compendium of Continuing Education in Dentistry (Jamesburg, N.J.: 1995),2013:34(3):e33–e37.
14. Zeitler DL. “Prophylactic antibiotics for third molar sur- gery,” Journal of Oral and Maxillofacial Surgery,1995:53(1):61–64.
15. Xue P, Wang J, Wu B, Ma Y, Wu F, Hou R. “Efficacy of antibiotic prophylaxis on postoperative inflammatory com- plications in Chinese patients having impacted mandibular third molars removed: a split-mouth, double-blind, self- controlled, clinical trial,” British Journal of Oral and Maxil- lofacial Surgery,2015:53(5)416–420.
16. Hall G, Heimdahl A, Nord CE. “Effects of prophylactic administration of cefaclor on transient bacteremia after dental extraction,” European Journal of Clinical Microbiology & Infectious Diseases,1996:15(8):646–649.
17. Lockhart PB, Loven B, Brennan MT, Fox PC. “The evidence base for the efficacy of antibiotic prophylaxis in dental practice,” The Journal of the American Dental Asso- ciation,2007:138(4):458–474.
18. Luaces-Rey R, Arenaz-Bu´a J, Lo´pez-Cedru´n-Cembranos J, Mart´ınez-Roca C, P´ertega-D´ıaz S, *et al*. “Efficacy and safety comparison of two amoxicillin admin- istration schedules after third molar removal. A randomized, double-blind and controlled clinical trial,” Medicina Oral Patolog´ıa Oral Y Cirugia Bucal,2010:15(4):e633–e638.
19. Ramos E, Santamar´ıa J, Santamar´ıa G, Barbier L, Arteagoitia. “Do systemic antibiotics prevent dry socket and infection after third molar extraction? A systematic review and meta-analysis,” Oral Surgery, Oral Medicine, Oral Pa- thology and Oral Radiology,2016:122(4):403–425.
20. Noordzij M, Dekker FW, Zoccali C, Jager KJ. “Study designs in clinical research,” Nephron Clinical Practice,2009:113(3):c218–c221.
21. Bortoluzzi MC, Manfro R, De De´a BE, Dutra TC. “Incidence of dry socket, alveolar infection, and postoperative pain following the extraction of erupted teeth,” The Journal of Contemporary Dental Practice,2010:11(1):E033–E040.
22. Demirbas F, Gjermo PE, Preus HR. “Antibiotic prescribing practices among Norwegian dentists,” Acta Odontologica Scandinavica,2006:64(6):355–359.
23. Jaunay T, Dambrook P, Goss A. “Antibiotic prescribing practices by South Australian general dental practitioners,” Australian Dental Journal,2000:45(3):179–186.
24. Sancho-Puchades M, Herraez-Vilas JM, Valmaseda-Castellon E, Berini-Aytes L, Gay-Escoda C. “Analysis of the antibiotic prophylaxis prescribed by Spanish Oral Sur- geons,” Medicina Oral Patolog´ıa Oral Y Cirugia Bucal,2009:14(10):e533–e537.
25. Thomas DW, Hill CM. “An audit of antibiotic pre-scribing in third molar surgery,” British Journal of Oral and Maxillofacial Surgery,1997:35(2):126–128.
26. Ko¨hler M, Meyer J, Linder M, Lambrecht JT. A. Filippi, and E. M. Kulik Kunz, “Prescription of antibiotics in the dental practice: a survey of dentists in Switzerland,” Schweizer Monatsschrift Fur Zahnmedizin,2013:123(9):748–759.
27. S. Goud S Fernandes, Nagesh L. “Are we eliminating cures with antibiotic abuse? A study among dentists,” Nigerian Journal of Clinical Practice,2012:15(2):151–155.
28. Chuang SK, Perrott DH, Susarla SM, Dodson TB, “Risk factors for inflammatory complications following third molar surgery in adults,” Journal of Oral and Maxillofacial Surgery,2008:66(11):2213–2218.
29. Bui CH, Seldin EB, Dodson TB. “Types, frequencies, and risk factors for complications after third molar extrac- tion,” Journal of Oral and Maxillofacial Surgery,2003:61(12):1379–1389.
30. Shigeishi H, Ohta K, Takechi M. “Risk factors for postoperative complications following oral surgery,” Journal of Applied Oral Science,2015:23(4):419–423.
31. Eshghpour M, Nejat AH. “Dry socket following surgical removal of impacted third molar in an Iranian population: incidence and risk factors,” Nigerian Journal of Clinical Practice,2013:16(4):496–500.
32. Lago-Me´ndez L, Diniz-Freitas M, Senra-Rivera C, Gude- Sampedro F, Ga´ndara Rey JM, Garc´ıa-Garc´ıa A. “Re- lationships between surgical difficulty and postoperative pain in lower third molar extractions,” Journal of Oral and Maxillofacial Surgery,2007:65(5):979–983.
33. Baqain ZH, Karaky AA, Sawair F, Khaisat A, Duaibis R, Rajab LD. “Frequency estimates and risk factors for postoperative morbidity after third molar removal: a pro- spective cohort study,” Journal of Oral and Maxillofacial Surgery,2008:66(11):2276–2283.
34. De Santana-Santos T, de Souza-Santos J, Martins-Filho P, da Silva L, de Oliveira E Silva E, Gomes A. “Prediction of postoperative facial swelling, pain and trismus following third molar surgery based on preoperative variables,” Medicina Oral Patolog´ıa Oral Y Cirugia Bucal,2013:18:e65–e70.
35. De Oliveira Neto PJ, De Souza Maliska, Sawazaki R, Asprino L, De Moraes M, Moreira RWF. “Temporal abscess after third molar extraction in the mandible,” Oral and Maxillofacial Surgery,2012:16(1):107–110.