

Characteristics of Odontogenic Mandibular Osteomyelitis at the Oral and Maxillofacial Surgery Department of RUSP Dr. Hasan Sadikin 2020 – 2023

Muktar Hutasoit¹, Seto Adiantoro², R. Agus Nurwiadh³, Harmas Yazid Yusuf⁴

¹ Resident, Department of Oral and Maxillofacial Surgery, RSUP Dr. Hasan Sadikin, Faculty of Dentistry, Universitas Padjadjaran, Bandung, 40161, Indonesia

² Head of Medical Staff Group of Oral and Maxillofacial Surgery, RSUP Dr. Hasan Sadikin, Faculty of Dentistry, Universitas Padjadjaran, Bandung, 40161, Indonesia

³ Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Padjadjaran, Bandung, 40132, Indonesia

⁴ Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Padjadjaran, Bandung, 40132, Indonesia

Received: 11-11-2024 / Revised 30-11-2024 / Accepted 21-12-2024

Corresponding author: Muktar Hutasoit

DOI: <https://doi.org/10.32553/ijmbs.v8i6.2912>

Conflict of interest: Nil

Abstract:

Osteomyelitis is a condition of bone inflammation caused by microorganisms that can involve trabecular or cortical bone, bone marrow, and periosteum. This study aims to analyze the characteristics of odontogenic mandibular osteomyelitis. This was an observational study with a retrospective descriptive approach. Based on medical record data, the research was conducted at Hasan Sadikin General Hospital (RSHS) Bandung from January 2020 to July 2023. The collected data included age, gender, location of occurrence, and surgical procedures for odontogenic mandibular osteomyelitis. In this study, 13 medical records were obtained. The most common characteristic among the subjects was advanced age above 48 years (46%) and male gender (69%). The most frequent location was the mandibular corpus (54%). The majority were treated with surgical procedures, namely fistulectomy (53%). The results of this study indicate that cases of odontogenic mandibular osteomyelitis are mostly managed in a multidisciplinary manner, combining surgery and antibiotic therapy. Multidisciplinary management in several studies on odontogenic mandibular osteomyelitis has shown to improve the healing and survival rates of patients with odontogenic mandibular osteomyelitis.

Keywords: Osteomyelitis, odontogenic osteomyelitis, mandible

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

1. Introduction

Osteomyelitis is an inflammatory condition of the bone caused by microorganisms which can involve trabecular or cortical bone, bone marrow and periosteum. [1] The incidence of osteomyelitis in Indonesia and globally is not yet known. Studies in the

United States show the incidence reached 21.8 cases per 100,000 population per year. [2]

Mandibular odontogenic osteomyelitis most often occurs in the mandibular region. The incidence of mandibular odontogenic

osteomyelitis is around 66.7% compared to the maxilla with an incidence of 33.3%.² This is because the maxillary bone has better vascularization and the cortical bone is not too thick so it is not susceptible to infection. Osteomyelitis of the maxilla is a rare case because the upper jaw, especially the palate, has good vascularization compared to the mandible with an incidence rate of 3% – 19%. [2]

Osteomyelitis can be caused by pathogen inoculation from surgical trauma, local spread from nearby joints or soft tissues, or hematogenically from a focus of infection. Infection can cause destruction of the bone cortex which can spread to the periosteum; this can reduce the blood supply to the periosteum and cause bone necrosis. Fragments of bone necrosis are called sequestrum, and new bone growth can also be found around the damaged periosteum, called involucrum. The percentage of cases of osteomyelitis in the jaw usually occurs in the 5-6th decade, with a male predilection being more dominant than female. The area most frequently affected is the posterior region of the mandible, while the incidence will increase in patients with poor oral hygiene, smokers and alcohol drinkers. [2,3]

Surgical therapy for mandibular odontogenic osteomyelitis is sequestrectomy, which is a procedure to remove infected bone fragments that are no longer vital in the infected jaw area. (4.5) Other therapies for mandibular odontogenic osteomyelitis are fistulectomy, debridement, extraction of the causative tooth and antibiotic therapy. Further surgical procedures may include segmental resection.[6]

2. Material and Method

This research is an observational study with a retrospective descriptive approach. This research was conducted at RSHS Bandung from January 2020 to July 2023. The population and sample for this study were all medical records of patients diagnosed with Mandibular Odontogenic Osteomyelitis in the Department of Oral and Maxillofacial Surgery at RSHS. This study uses inclusion and exclusion criteria.

Inclusion criteria were patients diagnosed with Mandibular Odontogenic Osteomyelitis and receiving treatment at the Inpatient Installation of dr. Hasan Sadikin in the period January 2020 – July 2023. The exclusion criteria in this study were incomplete patient medical record data. The variables studied included age, gender, domicile, and surgical therapy procedures. Categorical data processing was carried out using a computer program, and research data was grouped and expressed in proportions. This research has received ethical approval from the Health Research Ethics Committee of Dr. Hasan Sadikin Bandung with ethics committee approval number: 63/UN6.KEP/EC/2023.

3. Result

Results of data collection regarding Mandibular Odontogenic Osteomyelitis at KSM Oral and Maxillofacial Surgery, dr. Hasan Sadikin, for the period January 2020 - July 2023, there were 13 patients, of which 10 patients received treatment for the fistulectomy surgical procedure. The results of data collection regarding Mandibular Odontogenic Osteomyelitis in patients at KSM Oral Surgery RSHS are as follows in table 1.

Table 1: Subjects Characteristics

Sr. No.	Variable	Frequency N=13	%
1	Age		
	< 17	4	31%
	18-37	3	23%
	38-48	0	0%
	<48	6	46%
2	Gender		
	Male	9	69%
	Female	4	31%
3	Domicile		
	Bandung	6	46%
	Ciamis	1	8%
	Garut	2	15%
	Cirebon	1	8%
	Tasikmalaya	1	8%
	Kerawang	1	8%
	Cianjur	1	8%
4	Region at mandible		
	Symphysis	2	15%
	Parasymphysis	3	23%
	Body	7	54%
	Angle	1	8%
	Ramus	0	0%
	Condyle	0	0%
5	Therapy		
	Fistulectomy	10	53%
	Tooth Extraction	6	32%
	Debridement	1	5%
	Sequestrectomy	2	11%

The results of research using medical records based on age showed that patients whose ages were categorized into several year groups were under 17 years, 18-37 years, 38-48 years, and over 48 years. The number of patients in the age group under 17 years is 4 people or 31%, 18-37 years is 3 people or 23%, 38-48 years is 0 people or 0%, and over 48 years is 6 people or 46%. Based on gender criteria, it was found that 9 patients were male or 69% and 4 female or 31%. Based on the domicile criteria, it shows that the 2 highest domiciles are in Bandung with 6 people or 46%, and Garut with 2 people or 15%. Figure 4.1 is a diagram of the distribution of domicile

areas of patients with mandibular odontogenic osteomyelitis.

Based on the criteria for the locations involved, it shows that the highest incidence of osteomyelitis in the mandible occurs in the mandibular body, 7 people or 54%, the mandibular parasymphysis 3 people or 23%, the mandibular symphysis 2 people or 15% and the mandibular angle 1 person or 8%. Based on surgical procedures, it shows that the largest number was found in surgical procedures with fistulectomy, 10 people or 53%, then followed by extraction procedures for the causative tooth, 6 people or 32%, then with

sequestrectomy, 2 people or 11% and with debridement, 1 person. or 5%.

4. Discussion

The percentage of patients based on age shows that the largest number is found in the age category over 48 years, that is 6 people (46%), then the age category under 17 years is 4 people or (31%), the 18-37 year category is 3 people or (23%), and the age category of 38-48 years is 0 people or 0%. This is in line with research conducted by Andre et al (2017) who conducted research on 40 patients where the majority of patients who came for treatment were over 50 years old (70%). [2]. One of the reasons for this similarity was because the patients who were operated on were DR. Hasan Sadikin Bandung most often comes for treatment after complications occur, whereas those aged 37 - 48 years rarely receive treatment. The percentage of patients based on gender shows that the largest number was found in males, namely 9 people (69%), while in females it was 3 people (31%). This is in line with research conducted by Andre, et al (2017) who conducted the most research on men (45%). (2) Patients based on domicile of origin show that the largest number was found in Bandung City, namely 6 people, this is because many people sought treatment from Bandung City and its surroundings, then Garut Regency with 2 people, then Ciamis Regency, Cirebon Regency, Tasikmalaya Regency, Karawang Regency, and Cianjur Regency had 1 patient each from that area. The percentage of patients based on the location of osteomyelitis in the mandible showed that the largest number was found in the mandibular corpus, 7 people (54%), in the mandibular parasymphysis, 3 people (23%), and in the mandibular symphysis, 2 people (15%). This is related to the mandibular bone in the corpus being harder than other parts of the mandible which means that if trauma and infection occurs it will be difficult for the healing process and also the vascularization will be less. [2,25] Patients based on

surgical procedures showed that the largest number was found in fistulectomy, namely 10 people, followed by extraction of the causative tooth for 6 people, then surgical therapy with sequestrectomy for 2 people and then with debridement therapy for 1 person. Hotchen, et al, studied the effect of surgical debridement management and the use of antibiotics on the quality of life of patients suffering from osteomyelitis. This study showed that there was a significant improvement in quality of life in patients who underwent surgical debridement one year earlier. In addition, patients who received antibiotic therapy also showed improved quality of life. [26]

The results of this study, most cases of mandibular odontogenic osteomyelitis were managed in a multidisciplinary manner, namely a combination of surgery and antibiotic therapy. Multidisciplinary management in several studies regarding mandibular odontogenic osteomyelitis shows that this treatment can increase the healing and survival rate of mandibular odontogenic osteomyelitis patients. [22,24,25]

5. Conclusion

Osteomyelitis is an inflammatory condition of the bone caused by microorganisms which can involve trabecular or cortical bone, bone marrow and periosteum. This study aims to analyze the characteristics of mandibular odontogenic osteomyelitis. This study is an observational study with a retrospective descriptive approach. The age group over 48 years is more likely to be affected by mandibular odontogenic osteomyelitis, this is because patients undergo dental treatment afterward. The majority of patients suffering from mandibular odontogenic osteomyelitis are male, this is because men still do not maintain oral hygiene and also have a lifestyle of smoking and drinking alcohol. The city of Bandung is a city in West Java that has the highest cases of mandibular odontogenic osteomyelitis because the majority of patients registered for treatment

are from the city of Bandung. Surgical procedures for patients with mandibular odontogenic osteomyelitis are mostly fistulectomy, debridement and sequestrectomy. For all surgical procedures, appropriate antibiotic therapy or a combination is still required. The location of mandibular odontogenic osteomyelitis most often occurs in the mandibular body. This is in accordance with the bone tissue of the mandibular corpus which is the hardest part of the mandible.

References

- Baltensperger M, Eyrich G. Osteomyelitis of the Jaws: Definition and Classification. In: Baltensperger MM, Eyrich GKH, editors. *Osteomyelitis of the Jaws* [Internet]. Berlin, Heidelberg: Springer; 2009 [cited 2023 Mar 30]. p. 5–56. Available from: https://doi.org/10.1007/978-3-540-28766-7_2
- Andre CV, Khonsari RH, Ernenwein D, Goudot P, Ruhin B. Osteomyelitis of the jaws: A retrospective series of 40 patients. *J Stomatol Oral Maxillofac Surg*. 2017;118:261–4.
- Haeffs TH, Scott CA, Campbell TH, Chen Y, August M. Acute and Chronic Suppurative Osteomyelitis of the Jaws: A 10-Year Review and Assessment of Treatment Outcome. *J Oral Maxillofac Surg*. 2018;76:2551
- Flynn TR. Unanswered Questions in Oral and Maxillofacial Infections, An Issue of Oral and Maxillofacial Surgery Clinics. Elsevier Health Sciences; 2011. 135 p.
- Abubaker AO, Lam D, Benson KJ. *Oral and Maxillofacial Surgery Secrets*. Elsevier Health Sciences; 2015. 557 p.
- Johnston DT, Phero JA, Hechler BL. Necessity of antibiotics in the management of surgically treated mandibular osteomyelitis: A systematic review. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2023;135:11–23.
- Peterson LJ. *Peterson's Principles of Oral and Maxillofacial Surgery*. PMPH-USA; 2012. 1686 p.
- Neville BW, Damm DD, Allen C, Chi AC. *Oral and Maxillofacial Pathology*. Elsevier Health Sciences; 2015. 928 p.
- Chatelain S, Lombardi T, Scolozzi P. Streptococcus anginosus Dental Implant-Related Osteomyelitis of the Jaws: An Insidious and Calamitous Entity. *J Oral Maxillofac Surg*. 2018;76:1187–93.
- Allal S, Rabuel V, Gengler C, Douchet C, Allal F, Zwetyenga N. Case report of osteomyelitis of the mandible in osteopetrosis and management considerations. *Int J Surg Case Rep*. 2021;81:105813.
- Haggerty CJ, Laughlin RM. *Atlas of Operative Oral and Maxillofacial Surgery*. John Wiley & Sons; 2015. 571 p.
- Rawung R, Moningkey C. Osteomyelitis: A Literature Review. *J Biomedik-JBM*. 2019;11:69–79.
- Koorbusch GF, Deatherage JR, Curé JK. How Can We Diagnose and Treat Osteomyelitis of the Jaws as Early as Possible? *Oral Maxillofac Surg Clin N Am*. 2011;23:557–67.
- Muraoka H, Hirahara N, Ito K, Okada S, Komatsu T, Ichiki S, et al. Characteristic ADC Values of Chronic Osteomyelitis in the Mandibular on Diffusion MR Imaging. *Int J Oral-Med Sci*. 2020;19:58–62.
- Baur DA, Altay MA, Flores-Hidalgo A, Ort Y, Quereshy FA. Chronic Osteomyelitis of the Mandible: Diagnosis and Management—An Institution's Experience Over 7 Years. *J Oral Maxillofac Surg*. 2015;73:655–65.
- Pattnaik B, Kumari M, Surendra Sharma S. Osteomyelitis as a consequence of ankylosis of TMJ: A case report. *IP Int J Maxillofac Imaging*. 2020;5:89–92.
- Iannucci J, Howerton LJ. *Dental Radiography - E-Book: Principles and Techniques*. Elsevier Health Sciences; 2021. 482 p.

18. Whaites E, Drage N. Essentials of Dental Radiography and Radiology. Elsevier Health Sciences; 2013. 493 p.
19. Barreda Hale M, Romero-Araya P, Cea Herrera M, Espinoza D, Castro N, Castro J, et al. Computer-assisted planning with 3D printing for mandibular reconstruction caused by a mandibular fracture with secondary osteomyelitis: A Case Report. Clin Case Rep [Internet]. 2021 [cited 2023 Mar 16];9. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/ccr3.4410>
20. Ogura I, Kobayashi E, Nakahara K, Igarashi K, Haga-Tsujimura M, Toshima H. Quantitative SPECT/CT imaging for medication-related osteonecrosis of the jaw: a preliminary study using volume-based parameters, comparison with chronic osteomyelitis. Ann Nucl Med. 2019;33:776–82.
21. Faisal, Rasul MI, Prasetiawaty E. Management of chronic osteomyelitis with extra oral fistula in the mandible: Makassar Dent J [Internet]. 2020 [cited 2023 Mar 15];9. Available from: <http://jurnal.pdgimakassar.org/index.php/MDJ/article/view/308>
22. Bolognesi F, Tarsitano A, Cicciù M, Marchetti C, Bianchi A, Crimi S. Surgical Management of Primary Chronic Osteomyelitis of the Jaws: The Use of Computer-Aided-Design/Computer-Aided Manufacturing Technology for Segmental Mandibular Resection. J Craniofac Surg. 2020;31:e156.
23. Bevin CR, Inwards CY, Keller EE. Surgical Management of Primary Chronic Osteomyelitis: A Long-Term Retrospective Analysis. J Oral Maxillofac Surg. 2008;66:2073–85.
24. Marschall JS, Flint RL, Kushner GM, Alpert B. Management of Mandibular Osteomyelitis With Segmental Resection, Nerve Preservation, and Immediate Reconstruction. J Oral Maxillofac Surg. 2019;77:1490–504.
25. Mattoo KA, Singh SP, Mishra K. Prosthetic Protection of a Healing Bone Defect Caused as a Result of Chronic Suppurative Osteomyelitis of the Mandible. 2014;2.
26. Hotchen AJ, Dudareva M, Corrigan RA, Ferguson JY, McNally MA. Can we predict outcome after treatment of long bone osteomyelitis?: a study of patient-reported quality of life stratified with the BACH classification. Bone Jt J. 2020;102-B:1587–96.