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Antibiotic Sensitivity Pattern of Bacterial in Abscess Patients from Odontogenic Infections in the emergency installation of Hasan Sadikin Hospital Bandung, from January – December 2020

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Abstract

Background*. Odontogenic infection is one of the diseases caused by bacterial infection both gram negative and positive which can extend to the periodontium, apex to involve wider tissue. The treatment that can be done is the administration of antibiotics where most of their use still requires supervision to avoid resistance.*
Objective*. This study aims to determine the pattern of bacteria, sensitivity and antibiotic resistance in patients with submandibular abscess due to odontogenic infection in the Emergency Installation of Hasan Sadikin Hospital.*
Method*. An analytical observational study with a retrospective approach using data on bacterial cult and resistance as well as medical records of patients with odontogenic infection abscesses in the Emergency Installation of the Hasan Sadikin Teaching General Hospital, Bandung in January 2020 – December 2020.*
Result*. Based on the data showed that as many as 66.6% of bacteria in cases of mandibular abscess were gram-negative bacteria which were dominated by Acinobacter baumanii with 20.83%. Tigecycline antibiotics gave the most sensitive results on the effective antibiotic sensitivity data in 32 cases or 8.21%.*
Conclusion*. The odontogenic infections in this study were dominated by gram-negative bacteria where effective antibiotic treatment was based on bacterial culture results. Tigecycline was the most effective antibiotic and showed the highest sensitivity described by Meropenem and Cefepime in the treatment of abscesses caused by odontogenic infections.*

Key words*: Odontogenic infection, abscess, sensitivity, antibiotic.*

Introduction

Infectious disease is a type of illness caused by bacteria, usually found in tropical areas such as Indonesia and some are even endemic.[4] Various factors cause high cases of infection, including poor nutrition, inadequate sanitation, and antibiotic resistance. Gram-negative bacteria that often cause infection are *Pseudomonas aeruginosa*, *Acinetobacter baumanni*, *Enterobacteria* producing ESBL (Extended Spectrum Beta Lactamase) or *carbapenemase*, and *Escherichia coli.* Another pathogenic bacterium often causes a high incidence of nosocomial infections is Staphylococcus aureus. Pathogens can cause widespread diseases associated with toxic shock syndrome due to food poisoning, endocarditis, pneumonia, osteomyelitis, septic arthritis, and encephalitis.[7]

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Staphylococcus aureus is responsible for 80% of suppurative diseases, with the skin surface as its natural habitat until later, the discovery of antibiotics, which infectious diseases that at that time could not be treated and could cause death can be cured and increased human survival.[8]

Odontogenic infection is a condition in which the tooth or the supporting tissues of the tooth experience an infection that extends from the periodontium to the apex involving the periapical bone tissue. The infection can also extend from the bone and periosteum to neighboring teeth or nearby structures. This odontogenic infection can harm other systems by spreading through the bloodstream. The etiology of odontogenic infections can be derived from caries, pulpitis, periapical abscess, gingivitis, pericoronitis, periimplantitis, and periodontitis.[12] Signs and symptoms of odontogenic infection in patients may include an inflammatory response, infection response, and lymphadenopathy response. Odontogenic infections can spread to the

surrounding tissues, including the primary spaces of the face and cause complications, so appropriate treatment is needed to treat odontogenic infections.[22-24]

Treatments that can be used to treat this disease are antibiotics, but repeated use of antibiotics in certain strains of bacteria can cause resistance.[4,5] Most antibiotic treatments happen in hospitals, but not all hospitals have a program to monitor bacteria resistance, control infection, supervise the use of antibiotics in hospitals, make new guidelines on an ongoing basis for the benefit of antibiotics and prophylaxis, and monitor resistance patterns by recording resistance test laboratory data so that we can use it to determine which antibiotics are still potent, safe and effective and produce an excellent clinical outcome.[9]

A hospital records sensitivity patterns by looking at laboratory sensitivity test data so it can be used as a guide for the use of antibiotics.[4] Patients in the emergency room with cases of submandibular abscess caused by odontogenic infection are patients who require appropriate action and treatment and adequate antibiotics. In Indonesia, antibiotic therapy for a bacterial infection is mainly based on past empirical experience or recommendations from foreign journals. This action cannot be justified considering that the pattern of disease-causing bacteria and the pattern of antibiotic resistance differ from region to region and also varies from time to time. The irrational use of antibiotics can trigger bacterial resistance.[10] The use of empirical antibiotics is carried out in almost all patients. Empirical antibiotics were administered based on bacterial patterns and bacterial resistance based on departmental units. Most of the patterns of bacteria and resistance reported in various journals are derived from the number of cases in the hospital. This study aimed to obtain the patterns of bacteria and resistance in patients with submandibular abscess due to odontogenic infection in the Emergency Installation of Hasan Sadikin Hospital.

Method

This study is an analytic observational with a retrospective approach using culture and bacterial resistance data as well as patient medical record data at the Emergency Installation of the Rumah Sakit Umum Pendidikan (RSUP) Hasan Sadikin Bandung.

The population in this study were all bacterial culture lab results of oral surgery patients who experienced abscesses due to odontogenic infections in January 2020 - December 2020 with inclusion criteria namely medical records and bacterial culture results of oral surgery patients at the Emergency Installation of Hasan Sadikin Hospital Bandung who experienced abscesses, submandibular tract due to odontogenic infection. Exclusion criteria in this study were medical records of patients with abscesses that were not caused by odontogenic infection and were not accompanied by bacterial culture results.

This study has received ethical approval from the Health Research Ethics Committee of the Rumah Sakit Umum Pendidikan (RSUP) Dr. Hasan Sadikin Bandung. This study was conducted by collecting patient data, then submitting a request to obtain the patient's medical record that had been in the data, identifying the patient's diagnosis of submandibular abscess according to the medical record data, filling out forms by researchers, recapitulating data using Microsoft Excel, as well as data processing and data analysis. The data are presented in the form of frequency distribution tables, percentages, and mean values on bacterial patterns and antibiotic sensitivity tests in patients with submandibular abscesses originating from odontogenic infections in the emergency department of Hasan Sadikin Hospital, Bandung for the period January – December 2020.

RESULT

This study was done on 48 patients, consisting of 29 males and 19 females. Based on the bacterial culture data, which is the result of swab examination on the base of the abscessed tissue, 66.6% of the bacteria's highest number in mandibular abscess cases was gram-negative, which was dominated by *Acinobacter baumanii* with 20.83%, followed by *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* with 12,5%.

Table 1. Demography Data

Demography	Total	Percentage
Sex		
Male	29	60,41%
Female	19	39,59%
Age		
Toddler	2	4,16%
5-11 y.o	2	4,16%
12-25 y.o	6	12,5%
26-45 y.o	12	25%
46-65 y.o	26	54,16%

Table 2. Bacterial Data Culture

Bacteria	Total	Percentage
Gram positive	18	37,5%
Gram negative	32	66,6%
Bacteria Species		
Seratia marcescens	2	4,17%
Pseudomonas aeruginosa	6	12,50%
Streptococcus anginosus	2	4,17%
Streptococcus viridans	1	2,08%
Staphylococcuss epidedrmidis	2	4,17%
Streptococcus mitis/Streptococcus oralis	2	4,17%
Acinobacter baumanii	10	20,83%
Klebsiella pneumoniae	6	12,50%
Escherichia colli	2	4,17%
Enterobacter clocae	3	6,25%
Staphylococcus hominis	4	8,33%
Streptococcus parasanguinis	1	2,08%

Pseudomonas putida	1	2,08%
Stenothrophomonas malthophillia	1	2,08%
Enterobacter omnigenus	1	2,08%
Staphylococcus aureus	3	6,25%
Streptococcus agalactiae	3	6,25%
Tidak terdapat pertumbuhan mikroorganisme	8	16,67%
Candida parapsilosis	1	2,08%
Candida tropicalis	1	2,08%

In the antibiotic sensitivity data obtained from the result of bacteria sensitivity culture to the tested antibiotics, the Tigecycline antibiotic gave the most sensitive results in its effectiveness in inhibiting and killing bacteria in 32 cases (8.21%) of a submandibular abscess.

Table 3. Antibiotic Sensitivity Data

Sensitive Antibiotic	Total	Percentage
Amikacin	18	4,62
Amphotericin B	2	0,51
Ampicillin	13	3,33
Aztreonam	7	1,79
Benzylpenicillin	4	1,03
Cefazolin	6	1,54
Cefepime	22	5,64
Cefotaxime	13	3,33
Ceftaxime	1	0,26
Ceftazidime	11	2,82
Ceftriaxone	12	3,08
Cefuroxime	7	1,79
Cephalotin	7	1,79
Chloramphenicol	8	2,05
Ciprofloxacin	18	4,62
Clindamycin	14	3,59
CO-trimoxasole	16	4,10
Ertapenem	16	4,10
Erythromycin	10	2,56
Flucoanazole	2	0,51
Flucytosin	2	0,51
Gentamycin	19	4,87
Levofloxacin	16	4,10
Linezolid	9	2,31
Meropenem	22	5,64
Micafungin	2	0,51
Moxifloxacin	15	3,85
Piperaciloin	14	3,59
Tazobactam	14	3,59
Tetracycline	8	2,05
Tigecycline	32	8,21
Trimethoprim-Sulfamethoxazole	1	0,26
Vancomycin	17	4,36
Voriconazole	2	0,51
Cefoxitin	1	0,26
Sulbactam	9	2,31

Discussion

A retrospective study on bacterial culture and sensitivity data showed that in 48 cases of submandibular abscess caused by odontogenic infection, for male and female sex 1.5:1, the age of submandibular abscess cases with the most age with 54.16% was 46-65 years. It is in accordance with the study of Scott *et al.* with the most cases in adults between 40-50 years.

The etiology of submandibular abscess found in this study is odontogenic, it's in accordance to Bailey Bj who stated that the source of infection is usually odontogenic. Most of the etiology usually comes from dental infection, especially in the mandibular M2 and M3 teeth. This is because the relationship between the roots of these teeth extends to the bottom, where the mylohyoid muscle enters the mandible, which is directly adjacent to the submandibular space. This study showed a bacterial pattern dominated by gram negative bacteria at 66.6% and gram positive bacteria at 37.5%. This is because the atmosphere in the abscess tissue causes more dominant growth of anaerobic bacteria than aerobic bacteria. This study showed a bacterial pattern consisting of *Acinobacter baumanii*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus hominis*, *Staphylococcus aureus*, *Streptococcus agalactiae*, and *Streptococcus oralis*.

The basic principles of abscess management are assessing the severity of infection, evaluating the patient's body defense mechanism level, determining treatment plans, surgical intervention, supportive therapy, selecting appropriate antibiotics, and evaluating and monitoring the patient's condition. The treatment given in this study was in the form of drainage incision, removal of the infection source, and medication. The drainage incision action was aimed at reducing the pressure or decompression of the abscess pressure in the submandibular space, the change in the atmosphere causes anaerobic bacteria to be exposed to oxygen resulting the anaerobic bacteria to die and also reduce the difficulty of opening the patient's mouth so that tooth extraction can be carried out. Extraction of the infection source is carried out not only on the tooth that causes the abscess but also with the teeth in other regions that are at risk of becoming a new source of infection in the oral cavity, for example, in one case of abscess originating from 48 was found in another tooth in the other region that are at risk of becoming a new source of infection.

The community tendency when experiencing a submandibular abscess is when the patient has a history of toothache, the patient prefers to delay dental treatment and only consume drugs without a dentist's instruction. This causes the level of bacterial resistance in cases of submandibular abscess to be quite high so that initial empirical antibiotic therapy in patients cannot be done. Ideally, the administration of antibiotics in submandibular abscess patients is adjusted to the results of pus culture, but this takes a long time to determine the results of culture and sensitivity tests. In a study conducted by Shinta *et al*, using a triple drug consisting of ceftriaxone, gentamicin, and metronidazole in a case of deep neck abscess at Dr. Hospital. Kariadi, this was also

stated by Meher who explained that for developing countries the administration of antibiotic therapy was an effective therapy before the results of culture and sensitivity tests. This study found that the most sensitive antibiotics to most of the culture results sequentially were Tigecycline, Meropenem, Cefepime, Gentamycin, Amikacin, Levofloxacin, and Ceftriaxone.

Conclusion

Submandibular abscess is caused by odontogenic infection which generally originates from M2 or M3 teeth. The tendency of patients to delay dental treatment results in infection extending to the formation of pus and filling the submandibular space. Antibiotic drug therapy without the direction of a dentist causes patients to take antibiotics irregularly and causes antibiotic resistance. Initial empiric antibiotic therapy in patients with submandibular abscess may not have the maximum effect due to this, so it is ideal to wait for the results of the bacterial culture.

Management of abscess cases must be carried out based on the basic principles of submandibular abscess management, namely, assessment of the severity of the abscess, appropriate antibiotics, to surgical intervention, incision drainage of the abscess and extraction of the source of infection. This study found submandibular abscess tendency cases to be caused by the mandibular M2 and M3 teeth. The most common bacterial culture results were Acinobacter baumanii, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus hominis, Staphylococcus aureus, Streptococcus agalactiae, and Streptococcus oralis. The most important management is incision drainage accompanied by antibiotics according to culture results and sensitivity, and based on empirical evidence in this study are Tigecycline, Meropenem, and Cefepime.

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