Background: Many odontogenic infection cases do not need antibiotic prescriptions. The excessive use of antibiotics can lead to microbial resistance. Objective: This study aims to acknowledge the rationale and varieties of antibiotic prescriptions in odontogenic infection treatment by dentists. Methods: Data were collected from 513 patients’ medical records from the provincial public hospital and district public health center (PHC), Kupang City, from January to June 2016. The variables of this study were odontogenic infections treated with antibiotic therapy and the span of that antibiotic therapy. Results: Antibiotic use was not required in odontogenic infection cases: periapical abscess (27%), nonsurgery tooth extraction (20.7%), apical periodontitis (17.3%), and pulpitis (15%). Amoxicillin (76%) and clindamycin (12%) are widely used in odontogenic infection treatment. Based on the duration of therapy, it was found that the use of amoxicillin was 44% and clindamycin was 34%. Conclusion: Excessive antibiotic use is done by general dental practitioners in the treatment of odontogenic infection. Strict rules for antibiotic prescription are needed to prevent antibiotic resistance.

Keywords: Antibiotic resistance, dental practitioner, odontogenic infection

The Rational Use of Antibiotics by Dentists for Odontogenic Infection Treatment in Kupang, East Nusa Tenggara

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Abstract

The use of an antimicrobial substance aims to kill or inhibit bacteria that cause infection. Recently, some antimicrobials have become ineffective in treating microbial infection. Antimicrobial resistance increases disease, health costs, and mortality rates. Previous results demonstrate that, every year, 700,000 deaths in India are related to antimicrobial resistance and at least 23,000 Americans die because of resistant bacterial infections. Moreover, nearly 250,000 people in the US are infected by Clostridium difficile, and the main cause of this infection is the use of antimicrobials. The treatment of a patient with a resistant bacterial infection is expensive and requires additional time. The United States spends $20 billion annually to treat patients with antimicrobial resistance. Both Gram-positive and Gram-negative bacteria are included in antimicrobial-resistant bacteria. Staphylococcus aureus and Enterococcus species are Gram-negative bacteria commonly found in American patients that resist antimicrobials. Resistant Gram-negative bacteria can also include Enterococcus, Pseudomonas aeruginosa, and Actinobacteria. Furthermore, Streptococcus pneumoniae and Mycobacterium tuberculosis as Gram-positive bacteria also reported to resist antimicrobials.

One of the major contributing factors of the increased resistance against antimicrobials is the irrational or overuse of antibiotic prescriptions. An estimated 30%–50% of prescriptions were not in accordance with the indication of the treatment, the length of use of antimicrobial therapy, and the type of the antimicrobial. Further research shows that 30%–60% of antibiotic prescriptions in emergency units were not essential, unrelated, and suboptimal. Dental practitioners have contributed to the increase in antimicrobial resistance.

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antimicrobial resistance. Globally, dental practitioners prescribe a total of 9%–10% of all antimicrobial prescriptions. A previous study found that dental practitioners prescribed unnecessary antimicrobials in treatments such as nonsurgical tooth extraction, gingivitis, and irreversible pulpitis.⁶

Along with unnecessary use by medical practitioners, the increase of antimicrobial resistance can also be attributed to patients with self-medication by purchasing antimicrobials in a pharmacy without a prescription. Self-medicated patient can be a risk factor because of the incorrect use of the suggested dosage. The other factor that can increase the antimicrobial resistance is discontinuing antimicrobial consumption before the recommended length of use,⁷ in other words, incomplete antimicrobial use.

Dental and oral infections are commonly found in Indonesia, especially in East Nusa Tenggara (NTT).⁸ The lack of dental health promotion and prevention in schools can be a supporting factor for poor dental health in developing countries, such as Indonesia.⁹ Dental diseases, such as pulpitis, tooth abscess, gangrene tooth, and periodontal pocket are commonly found in hospitals and private dental clinics in Kupang. This lack of awareness can be a leading factor for the high risk of oral and dental infection and supports the excessive use of antimicrobials by society and medical practitioners, especially dental practitioners.¹⁰

Dental practices prescribe antibiotics for prophylaxis and therapy.¹¹ Antimicrobial prescription for prophylaxis is provided for the prevention of endocarditis and infection in patients with congenital heart disease.¹¹ For therapy, antimicrobial prescriptions are used for pericoronitis, facial cellulitis, chronic infection therapy, acute ulcerative gingivitis, and lateral periodontal abscess.⁵ Antimicrobial prescription is not necessary for scaling, simple tooth extraction and without compromised immunity system, irreversible pulpitis, tooth abscess, or endodontic treatment that do not require surgery.

The antibiotic use before or after nonsurgical tooth extraction, or in endodontic treatment, shows an ineffective result.¹⁰ Until now, there are no data available on the rationale of antimicrobial prescription by dental practitioners in Indonesia. This study aims to show the rationale of antimicrobial prescription by dental practitioners in odontogenic infection treatments in Kupang, NTT.

**METHODS**

This descriptive study utilized survey method to collect the data from patients’ medical records in provincial public hospital, W. J. Yohannes and district public health center (PHC), Kupang City, from January to June 2016. Provincial hospital was chosen because this hospital is the central of referral from 23 districts in East Nusa Tenggara, which has 8 dentists from different Indonesian universities and has around 300 dental outpatients per month. PHC, Kupang City, was chosen because this PHC is located in the city center with two full-time dentists working in the facilities. Data collected from this hospital included 300 samples, and the rest was collected from district PHC. The researchers collaborated with hospital and PHC staff to collect the data. The variables of this study were odontogenic infections treated with antibiotic therapy (such as pulpitis, gingivitis, dry socket, pericoronitis, periapical abscess, apical periodontitis, and nonsurgery tooth extraction), the varieties of the antibiotics, and the length of time for the antibiotic therapy.

**RESULTS**

This study found that there was an irrational antibiotic use in East Nusa Tenggara. Antibiotic therapy is used for periapical abscess (27%), nonsurgery tooth extraction (20.7%), apical periodontitis (17.3%), and pulpitis (15%) [Figure 1]. This study shows that the most common antibiotics used in the treatment of odontogenic infection are amoxicillin (76%) and clindamycin (12%) [Figure 2]. Amoxicillin was mostly prescribed for nonsurgery tooth extraction (96.2%), and clindamycin (24.7%) was prescribed for apical periodontitis [Figure 3].

In this study, we found that 89% of amoxicillin prescriptions were designated for use three times a day, and 44% of prescribed amoxicillin was recommended to be taken five times a day. Clindamycin prescriptions (96%) were set for three times a day, and 34% of clindamycin prescriptions were taken over the course of 3 days [Table 1].

**DISCUSSION**

There is no strict regulation and control of antibiotic use in a hospital and PHC. The facilities provide antibiotics without proper evaluation on the antibiotic rationality.

The data of this study were obtained from patients’ medical records, which were treated with antibiotics from January to June 2016 in PHC as well as in the hospital in Kupang, NTT. The total sample included 513 patients who were prescribed antibiotic therapy by 10 general dental practitioners in provincial hospital and PHC, Kupang City, East Nusa Tenggara.

This study shows that of the dental diseases treated by antibiotic therapy, 27% was periapical abscess. Literature
have shown that antibiotic therapy is not necessary for a periapical abscess. The therapy for a periapical abscess is drainage and the removal of the cause without antibiotic treatment. The debridement and/or drainage for a periapical or periodontal abscess are irreplaceable by antibiotic therapy. Antibiotic therapy, such as clindamycin, can be provided to patients with cellulitis or sepsis because of the periapical abscess.

Antibiotic therapy is sometimes indicated for tooth extraction. The percentage of infection after nonsurgical tooth extraction is relatively small, only 3%. Asepsis tooth extraction can prevent antibiotic use. This study showed that around 12% of nonsurgical tooth extraction patients were prescribed an antibiotic. A study done on the antibiotic use in Pakistan showed that antibiotics were also prescribed for nonsurgical tooth extraction by dental practitioners. In comparison, antibiotic therapy was not required for nonsurgical tooth extraction in developed countries, such as the United Kingdom. Antibiotic therapy in the UK is only provided to patients who undergo surgical tooth extraction with a heart disease or a compromised immunity system.

In this study, 15% of patients with pulpitis were prescribed with antibiotics. This treatment is not according to the available theory, which stated that condition involving a local operative treatment, such as endodontic treatment or tooth extraction, does not require antibiotic therapy. Excessive antibiotic prescription for treating irreversible pulpitis was also done by general dental practitioners in Croatia (7.4%) and India (28%). Of the patients with periapical periodontitis, 17% were prescribed an antibiotic. General dental practitioners in Croatia (10.3%) and India (20%) also prescribe the antibiotics for periapical periodontitis.

We determined that the primary choice of antibiotic for the treatment of odontogenic infection was amoxicillin. Amoxicillin is widely prescribed in a hospital and PHC because this antibiotic is the most available antibiotic with affordable price. Similar to previous studies, amoxicillin is the most common antibiotic used in daily dental practice. We also found that 15% of general dental practitioners prescribe antibiotics for treating patients with pulpitis, while in previous studies, 20% of general dental practitioners prescribed an antibiotic for treating pulpitis. Antimicrobial therapy is not necessary for treating pulpitis. Treatment for pulpitis and odontogenic infection is pulpectomy and pulpotomy.

We found that 57% of dental practitioners prescribed amoxicillin and 66% prescribed clindamycin for 3 days. However, according to Nataraj (2004), the duration of amoxicillin and clindamycin should be 5–7 days. The
incorrect duration for antibiotic use can cause resistance to the antibiotic.  

**CONCLUSION**  
Antibiotic prescriptions provided to patients with pulpitis, gingivitis, pericoronitis, periapical abscess, apical periodontitis, and nonsurgery tooth extraction were futile. Periapical abscess was the most common odontogenic infection prescribed with an antibiotic. Hospitals and PHC need to have strict regulations and control the rational use of antibiotic prescriptions. Dental faculties also need to educate students about the rationality of antibiotic use.

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There are no conflicts of interest.

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