



Exploration of antibiotic usage pattern in dental professionals

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Abstract

To explore the antibiotic treatment pattern among dental professionals, who working in Dental hospital, Faculty of Dentistry, Mahidol University. A self-administered questionnaire was used in this study. The questionnaire was sent to dental professionals at Dental hospital, Faculty of Dentistry, Mahidol University. The questionnaire was included demographic data and pattern of antibiotic treatment and usage. Information was collected on the number and names of antibiotic and prescription data. All result was analyzed with descriptive statistics using Statistical Package for Social Science (IBM SPSS version 22, USA). 100% of dental professionals did not prescribe antibiotics to manage oral diseases in cases of halitosis and orthodontic treatment. More than 80% of dental professionals specifically prescribed antibiotics in cases of endodontic treatment, orofacial infections and surgical removal of impacted tooth, and more than 50% of dental professionals prescribed antibiotics in dental abscess (pericoronal abscess, dento-alveolar abscess and periapical abscess), extraction by open method, swelling condition, flap surgery and implant placement. But did not use antibiotics in simple tooth fracture, dental caries, apical periodontitis and dry socket. Regarding to the situation questions, it was found that 96.15% of dental professionals chose to prescribe Penicillin as the first-choice of localized infection and 100% of dental professionals prescribed Clindamycin in case of Penicillin allergy. Some of dental professionals potentially had a misconception in indications of antibiotics prophylaxis usage in congenital heart disease and prosthetic cardiac valve. There was still an irrational use of antibiotic within dental practitioners, which may lead to the issue of antibiotic resistance. Thus, the need for rational prescribing should be considerably for further developing of antibiotic usage program in Dental hospital.

Keywords: Antibiotic usage pattern, dental professionals, dental hospital

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1. Introduction

Rational use of medicines defines that “patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and the lowest cost to them and their community” [1] and can be performed by the 5 rights: right drug, right dose, right route, right time and right patient [2]. At present, antibiotics are important to treat infectious diseases. However, wrong, irrational, inappropriate or prescribing of antibiotic usage was the cause of antibiotic resistance. Some studies [3] stated that the urgent need to decrease proliferation of antibacterial resistant bacteria has refocused attention on the proper use of antibacterial agents. Through the World Health Organization announcement, this topic of antibiotic usage has also stated the slogan for antibiotic resistance as “Antibiotic resistance: No action today, No cure tomorrow”,

and has stressed for an international action for the resistance crisis since 2011 [4, 5].

Accordingly, antibiotic resistance is a major challenge for global health care. And dental professionals play a role to support the quality of antibiotic usage. Scientific literature evidence suggests that dental professionals are also prescribing increased 62.2% [6]. When prescribed rationally, antibiotics are beneficial in patient care. However, with this prescribing pattern, the widespread use of antibiotics, has led to development of antibiotic resistant in common antibiotic usage. As this situation, not only resistant case, irrational antibiotic usage also causes adverse side effects [7].

One of the deviations from common antibiotic usage in dentistry is antibiotic prophylaxis for patients with cardiac conditions and at risk of bacterial endocarditis. The American Heart Association (AHA) guidelines [8] focus on antibiotic prophylaxis for patients with the following:

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Table 1. Demographic and characteristic of respondents.

Characteristic	Number	%
Age (years)		
25-30	82	78.85
>30	22	21.15
Years of experience (years)		
0-5	72	69.23
6-10	18	17.31
11-15	8	7.69
>15	6	5.77
Area of specialization		
General Dentistry	26	25
Prosthodontics	4	3.8
Periodontics	4	3.8
Endodontic	14	13.5
Operative Dentistry	2	1.9
Orthodontics	2	1.9
Pediatric Dentistry	2	1.9
Oral and Maxillofacial Surgery	48	46.2
Oral and Maxillofacial Pathology	2	1.9

1. Prosthetic cardiac valves, including transcatheter-implanted prostheses and homografts.

2. Prosthetic material used for cardiac valve repair, such as annuloplasty rings and chords.

3. Previous infective endocarditis (IE).

4. Unrepaired cyanotic congenital heart disease or repaired congenital heart disease, with residual shunts or valvular regurgitation at the site of or adjacent to the site of a prosthetic patch or prosthetic device.

5. Cardiac transplant with valve regurgitation due to a structurally abnormal valve. However, there was a study [9] that found the compliance of dental professionals to the current guidelines seems not to be optimal, such as prescribing antibiotic prophylaxis in patients with stable angina which is unnecessary.

Exploration of scientific literature revealed very limited studies in Thailand. So, quantifying the impact of antibiotic treatment and usage pattern is necessary for dental practice improvements, as well as to develop measurable rational antibiotic usage program to report against the Antimicrobial Resistance Strategy. Thus, before developing the program, to assessing the antibiotic prescription pattern and resistance awareness among dental professionals are still needed.

According to further developing antibiotic usage program in the Dental hospital, Faculty of Dentistry, Mahidol University, it is formerly necessary to explore the incident of antibiotic treatment patterns among dental professionals. Hence, the aim of the study is to explore the antibiotic treatment pattern among dental professionals, who working in Dental hospital, Faculty of Dentistry, Mahidol University.

2. Materials and Methods

This study was a cross-sectional survey and conducted from December 2018 to January 2019. The respondents were dental professionals who work in special or departmental clinic in Dental hospital, Faculty of Dentistry, Mahidol University. Ethical approval was obtained from the Institutional Review Board of the Faculties of Dentistry and Pharmacy, Mahidol University with COE.No.MU-DT/PY-IRB 2018/050.0211.

2.1. Survey questions

The questions for the survey were developed and reviewed by antibiotic usage and resistance expert and clinical researcher for validity qualification. The survey respondents were asked to answer questions relating to the treatment of dental infection. The questionnaire consisted demographic variables of the respondents, and the questions pertaining to knowledge and practice of dental professionals before prescribing antibiotics (common antibiotic prescribing in each situation, clinical conditions for which antibiotics prescribing, awareness about antibiotic prophylaxis).

2.2. Survey administration

The questionnaires were delivered using an online survey. All responses (as dental professionals) were anonymous. The link to the survey was sent along with information to respondents' pack that clearly detailed the aims of study and a letter of encouragement to respondents in the survey. The letter was endorsed by a researcher. Survey respondents were asked to answer questions on the basis of their personal opinion and practice.

2.3. Statistical analysis

The data was obtained and compiled with descriptive statistical analysis and using Statistical Package for Social Science (IBM SPSS version 22, USA).

3. Results

A total of 104 from 116 dental professionals responded to this survey, thus making a response rate as 89.66%, which was satisfactory. Majority of the respondents was at the age range of 25-30 years old (78.85%) with 0-5 years of experience (69.23%) and almost were Oral and Maxillofacial Surgery specialist in the present survey (88.85%), the respondents' demographic and characteristic data were presented in Table 1.

The study was found that 100% of response not to use antibiotics to manage oral diseases cases of halitosis and orthodontic treatment. More than 80% of response relied on not using antibiotics in tooth fracture, dental caries with pulpitis, endodontic treatment, apical periodontitis and dry socket. While more than

Table 2. The response rate of respondents.

Question	% Answer 'YES'	% Answer 'NO'
Do you routinely prescribe antibiotics in the following situations?		
Halitosis	0.00	100
Tooth fracture	1.92	98.08
Dental caries with pulpitis	11.54	88.46
Dento-alveolar abscess	59.62	40.38
Orofacial infections with signs of systemic involvement	96.15	3.85
Pericoronal abscess	69.23	30.77
Extraction by open method	42.31	57.69
Surgical removal of impacted tooth	80.77	19.23
Flap surgery	65.38	34.62
Implant placement	63.46	36.54
Orthodontic treatment	0.00	100.00
Endodontic treatment	3.85	96.15
Localized intraoral swelling	51.92	48.08
Acute facial swelling	84.62	15.38
Periapical abscess	55.77	44.23
Apical periodontitis	13.46	86.54
Dry socket	5.77	94.23

Table 3. The response rate of respondents due to antibiotic situation.

Questions	% Answer
In case of localized infection, non-allergic patient;	
What antibiotic will be the first line to begin?	
Penicillin	96.15
Metronidazole	1.92
Cephalexin	1.92
In case of localized infection in allergic to penicillin patient, the first line is	
Clindamycin	100
In which cardiac case, the patient will not need prophylaxis with antibiotics	
Stable angina	94.23
Congenital heart disease	3.85
Prosthetic cardiac valve	1.92

50% of response relied on not using antibiotics in extraction by open method. However, less than 50% of response relied on not using antibiotics in addition to dento-alveolar abscess, orofacial infections with signs of systemic involvement, pericoronal abscess, surgical removal of impacted tooth, flap surgery, implant placement, localized intraoral swelling, acute facial swelling and periapical abscess. The responses given by the respondents regarding antibiotic prescription for commonly encountered oral conditions and routine dental treatment are compiled and presented in Table 2.

Regarding to respondents' idea towards prescribing antibiotics in situation questions, it was found that the vast majority of respondents (96.15%) chose to prescribe Penicillin as their first-choice of antibiotic of localized infection, and all respondents chose to prescribe Clindamycin in case of Penicillin allergy. The most of response rate for the patient that not need pro-

phylaxis with antibiotics was stable angina (94.23%). Whereas, some dental professionals chose congenital heart disease (3.85%) and prosthetic cardiac valve (1.92%). The data was presented in Table 3.

4. Discussions

The objective of this study was to investigate the antibiotic usage pattern among dental professionals. The study was found that 100% of response not to use antibiotics to manage oral diseases cases of halitosis and orthodontic treatment. And the more than 80% of dental professionals in this study relied on using antibiotics in addition to the endodontic treatment. This finding showed the same specific learning of antibiotic usage from AAE Guidance on the Use of Systemic Antibiotics in Endodontics by American association of endodontists (AAE) [8], but not using antibiotics in

simple tooth fracture, dental caries, apical periodontitis and dry socket. According to a systematic review, usage of antibiotics to prevent above oral diseases was not warranted. Systemic antibiotics should be considered if there is a spreading infection that signals failure of local host responses in abating the advancing bacterial irritants, or if the patients' medical history includes the condition or diseases known to reduce the host defense mechanism or expose the patient to high systemic risk [10].

While the usage of antibiotic in other patterns, the results was shown obscure in dental and oral abscess condition. There was the study found that dental abscess (pericoronal abscess, dento-alveolar abscess and periapical abscess) and its complications position cases with early diagnosis and appropriate intervention was extremely important. The study said that determination of various host and environmental factors that put an individual at risk for development of dental abscess, influence the spread of infection from a localized collection at the apex of a tooth to a cellulitis and further life-threatening sepsis would aid treatment decisions. Increased reliance on novel molecular techniques has enriched to the knowledge of the diverse polymicrobial collection that constitutes a dental abscess [11]. But, at present, there is no consensus over the gold standard treatment as evidenced by the wide variety of surgical protocols and prescription of antibiotic in dental abscess condition.

Antibiotics are increasingly used in the treatment of orofacial infections. There was the available study suggested that antibiotic prescribing should be considered only after the conventional therapies have not been successful and used follow the guideline [12].

Additionally, there was limitation of scientific evidence for treatment and prophylactic with antibiotic prescription for dento-alveolar surgical procedures. In common as the scientific evidence, dental professionals were seen prescribing antibiotics for routine dento-alveolar surgical procedures including simple extractions, which demands attention. There was the study found that majority of the professionals felt adhering to the strict sterilized measures, in and around operative area during dental procedures were not enough to prevent infections; this might be the reason for majority of dental professionals to prescribe antibiotics [13]. However, another study found the point that there were the therapeutics recommends antibiotic prophylaxis and treatment for surgical procedures with a high infection rate and/or implantation of prosthetic devices. Applying this to the field of dentistry, antibiotic can be also recommended to the placement of dental implants. However, there are reports of the effects of antibiotic used in dental implant that there was no statistically significant difference between used and not used antibiotic in healthy patient [14]. Therefore, dentist should consider reasonably in antibiotic usage to reduce the developing bacterial resistance [15].

Furthermore, in case of local infection and antibiotic usage of choice, this study found the same as many literatures, that the dental professionals used Penicillin as the first line drug. Although Penicillin has a narrow antibiotic spectrum, it covers most bacteria involved in oral infections. For patients allergic to Penicillin, it is recommended to use Clindamycin which is highly effective against Gram-positive, anaerobic, and some Gram-negative bacteria [16].

In case of the prophylaxis with antibiotics, was a common practice, and has been widely accepted in the dental professionals. In this study the majority of respondent was following the same point of the paradigm that using antibiotic to prevention of bacterial endocarditis, indicated in risk patients in the context of any invasive procedure within the oral cavity - and following the guidelines of the American Heart Association (AHA) [17]. However, in this study, some of dental professionals were potentially misconception in indication of antibiotics prophylaxis usage. The strength of this study was that it provides a better understanding of antibiotic usage pattern among certain dental professionals. It will be baseline evidence for future research which will be conducted after the implementation of the dental strategic plan on antibiotic usage. But there was the limitation as, this study recruited respondents through online and social media. Some of the potential respondents might have not participated since they are unable to access online platforms, particular the older respondents which coincides with this study which found that most of respondent were dental professionals with 0–5 years of experience (69.23%) and 25–30 years old (78.85%). Years of experience may result in a difference of antibiotic usage pattern, so it has to be further studied in a future study.

However, this study does not assess antibiotics dispensing such as appropriateness of dosage regimens and patient counseling in dental practice. This may need to be measured in future studies.

5. Conclusions

There was still an over prescription in practitioners when compared to the other studies. This may have probably been due to inadequate understanding of the disease, less skill, and less competency in performing operative intervention measures. It has to be understood that dental diseases are largely because of local factors. So, the need for prescribing antibiotics should be considerably. Antibiotics should be used only as aides even when there is a real need and never as first-line treatment modality. In conclusion, the prescribing practices of dental professional can be improved by increasing awareness and following the recommended guidelines among dental practitioners for further develop of the antibiotic usage program in the Dental hospital.

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References

- [1] World Health Organization, Rational use of Medicines, Available from: https://www.who.int/medicines/areas/rational_use/en/, (accessed January 2020).
- [2] S. Mehta, N. Gogtay, From the pen to the patient: Minimising medication errors, *Journal of Postgraduate Medicine* 51(1) (2005) 3–4.
- [3] C. W. Stratton, Dead bugs don't mutate: susceptibility issues in the emergence of bacterial resistance, *Emerging Infectious Diseases* 9(1) (2003) 10–16.
- [4] A. Sharma, Antimicrobial resistance: no action today, no cure tomorrow, *Indian Journal of Medical Microbiology* 29(2) (2011) 91–92.
- [5] World Health Organization, World Health Day–7 April 2011, Available from: <https://www.who.int/world-health-day/2011/en/>, (accessed May 2019).
- [6] F. Marra, D. George, M. Chong, S. Sutherland, D. M. Patrick, Antibiotic prescribing by dentists has increased: why?, *The Journal of the American Dental Association* 147(5) (2016) 320–327.
- [7] P. Rochanadumrongkul, S. Chaimanakarn, Characteristics of adverse drug reactions and their antidotes in a dental hospital in Bangkok, Thailand, *Journal of Thai Interdisciplinary Research* 13(2) (2018) 56–60.
- [8] American association of endodontists, AAE Guidance on the Use of Systemic Antibiotics in Endodontics, Available from: https://www.aae.org/specialty/wp-content/uploads/sites/2/2017/06/aae_systemic-antibiotics.pdf, (accessed May 2019).
- [9] N. Termine, V. Panzarella, D. Ciavarella, L. Lo Muzio, M. D'Angelo, A. Sardella, D. Compilato, G. Campisi, Antibiotic prophylaxis in dentistry and oral surgery: use and misuse, *International Dental Journal* 59(5) (2009) 263–270.
- [10] G. A. Singh, H. Morrissey, A. Rahman, A systematic review and meta-analysis evaluating antibiotic prophylaxis in dental implants and extraction procedures, *Medicina (Kaunas)* 54(6) (2018) 95.
- [11] Shweta, S. K. Prakash, Dental abscess: A microbiological review, *Dental Research Journal* 10(5) (2013) 585–591.
- [12] G. Karibasappa, A. Sujatha, Antibiotic resistance-a concern for dentists?, *IOSR Journal of Dental and Medical Sciences* 13(2) (2014) 112–118.
- [13] A. Spagnolo, G. Ottria, D. Amicizia, F. Perdelli, M.L. Cristina, Operating theatre quality and prevention of surgical site infections, *Journal of Preventive Medicine and Hygiene* 54(3) (2013) 131–137.
- [14] J. Park, M. Tennant, L. J. Walsh, E. Kruger, Is there a consensus on antibiotic usage for dental implant placement in healthy patients?, *Australian Dental Journal* 63(1) (2018) 25–33.
- [15] G. M. S. Soares, L. C. Figueiredo, M. Faveri, S.C. Cortelli, P.M. Duarte, M. Feres, Mechanisms of action of systemic antibiotics used in periodontal treatment and mechanisms of bacterial resistance to these drugs, *Journal of Applied Oral Science* 20(3) (2012) 295–309.
- [16] S. S. Oberoi, C. Dhingra, G. Sharma, D. Sardana, Antibiotics in dental practice: how justified are we, *International Dental Journal* 65(1) (2015) 4–10.
- [17] R. A. Nishimura, C. M. Otto, R. O. Bonow, B. A. Carabello, J. P. Erwin, R. A. Guyton, P. T. O'gara, C. E. Ruiz, N. J. Skubas, P. Sorajja, 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, *Journal of the American College of Cardiology* 63(22) (2014) e57–e185.