



Knowledge and Awareness about Antibiotic Usage and Emerging Drug Resistance Bacteria among Dental Students

G. Pushpaanjali¹, R. V. Geetha^{2*} and T. Lakshmi³

¹Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

²Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

³Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author GP designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RVG and TL managed the analyses of the study. Author RVG managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2020/v32i1630647

Editor(s):

(1) Dr. Ilknur Dag, Eskisehir Osmangazi University, Turkey.

Reviewers:

(1) Ricardo Gassmann Figueiredo, Universidade Estadual de Feira de Santana (UEFS), Brazil.

(2) Gabrielle Limeira Genteluci, The Oswaldo Cruz Foundation, Brazil.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/59694>

Original Research Article

Received 03 June 2020
Accepted 08 August 2020
Published 24 August 2020

ABSTRACT

Antibiotics are commonly used in dental practice. It has been estimated that 10% of all antibiotic prescriptions are related with dental infection. Antibiotic treatment is a feature of pharmacotherapy with the particularity of providing both prophylactic and curative action. It was introduced in the mid twentieth century in the form of sulfa drug (1935), penicillin (1941), tetracycline (1948) and erythromycin (1952). Since then, antibiotics have focused much clinical and pharmacological research, in response antibiotics, the consolidation of new disease, and novel clinical situations. "Penicillin antibiotics are commonly use in dental practice. Amoxicillin, metronidazole and clavulanate are frequently prescribed drugs by dentists."

The aim of this study is to create knowledge and awareness about antibiotic usage and emerging

*Corresponding author: E-mail: geetha@saveetha.com;

drug resistance bacteria among dental students. The Questionnaires had been prepared and distributed to 100 participants of dental students. The resulting data have been analyzed using SPSS statistical software. Descriptive statistical analysis was carried out and chi square test was used and p value was calculated. Most of the participants in the survey were aware about antibiotic use and emerging drug resistance bacteria. From this present study, it can be concluded that the participants are aware about antibiotic usage and drug resistance bacteria.

Keywords: Antibiotics; bacteria; drugs; dental student; infection.

1. INTRODUCTION

Antibiotics are commonly used in dental practice. It has been evaluated that 10% of all antibiotic prescriptions are related with dental infection. Antibiotic treatment is a feature of pharmacotherapy with the particularity of providing both prophylactic and curative action. It was introduced in the mid twentieth century in the form of sulfa drug (1935), penicillin (1941), tetracycline (1948) and erythromycin (1952). [1] Since then, antibiotics have focused much clinical and pharmacological research, in response to antibiotics, the consolidation of new disease, and novel clinical situations [2]. Penicillin antibiotics are commonly use in dental practice. Amoxicillin, metronidazole and clavulanate are frequently prescribed drugs by dentists [3,4]. Antibiotics are designated when clinical signs of infection are apparent. Antibiotic prophylaxis is a common practice among dentists during invasive procedures that may cause bleeding and bacteraemia. Furthermore, it is indicated in dental practice for treating immunocompromised patients, evident signs of systemic infection and if the signs and symptoms of infection progress rapidly [5]. Bacteria that are present in the oral cavity like *Streptococcus mutans* and *Streptococcus sobrinus* have a central role in the etiology of dental caries, because these can adhere to the enamel salivary pellicle and to other plaque bacteria [6,7]. Streptococci that produce beta lactamase were secluded from the subgingival plaque of adults with periodontitis.

Production of beta-lactamase is, however, uncommon for most streptococci, where resistance is typically mediated by the alteration to the penicillin-binding protein [8,9]. Amoxicillin resistance has been reported in *Veillonella spp* and *Prevotella denticola* secluded from the root canal. In one study, all the 34 strains of facultative anaerobic bacteria isolated from the same root canals were susceptible to amoxicillin as were 96% strain of obligate anaerobes [10]. Dentists are the most frequent prescribers of

metronidazole. However, the emergence of resistance to this drug may be slower than if it were used alone, because in order to target both aerobic and anaerobic organisms, metronidazole is used empirically in combination with one or more antibiotics, although resistance to the drug may be associated with mobile genetic elements, aiding spread [11]. Antibiotic resistance has become one of the biggest threats to the successful treatment of infection. The warning came from WHO and several international and national organisations calling for immediate action to limit the further development and spread of resistant bacterial strain [12]. As per policy, during clinical years, dental students are authorized to prescribe antibiotics under supervision of their instructor. Attitude towards prescribing medications and experience with specific antibiotics usually developed during this early training year and many carry their experience with them into clinical practice [13]. The aim of this study is to create knowledge and awareness about antibiotic usage and emerging drug resistance bacteria among dental students.

2. MATERIALS AND METHODS

A cross sectional questionnaire survey was conducted among dental students in chennai A total 100 participants were evaluated using a questionnaire comprising 12 questions in an online survey regarding demographics, knowledge and awareness of antibiotic use and emerging drug resistant bacteria. All data were collected and analysed using SPSS software and were represented as pie charts. Descriptive statistical analysis was carried out and chi square test was used and p value was calculated. Any P value less than 0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

Most of the participants of the survey were aware about antibiotic use and emerging drug resistance bacteria.

Fig. 1 shows that 54% of people from the age group 17-20, 42% of people from age group 20-25 and 4% of people from the age group 25-28. Fig. 2 shows that 74% of people said that the patients need antibiotics after the tooth extraction and 26% of people said that they do not need antibiotics after the tooth extraction. Although having a tooth extraction is usually very safe, the procedure can allow harmful bacteria into the bloodstream. Gum tissue is also at risk of infection, to avoid this antibiotics is needed to take before and after tooth extraction. Fig. 3 shows that 76% of people said that they very oftenly prescribed antibiotics to their patients and 24% of people said that they prescribed antibiotics to their patients only if they required it. Antibiotics are commonly prescribed by dentists mainly because it is used for treatments and prevention of infections. Fig. 4 shows that 84% of people were aware about the antibiotic policy and 16% of people are not aware about the antibiotic policy. Antibiotic policy is the set of strategies and activities undertaken to organize the antimicrobial treatment in the hospital to achieve health outcomes for patients. Fig. 5

shows that 62% of people are aware about the method of controlling antibiotic resistance and 38% of people are not aware about the method of controlling antibiotic resistance. Antibiotics resistance and antibiotics associated adverse events are now some of our most serious global threats. Misuse and overuse of antibiotics have contributed to antibiotics resistance. Dentists prescribe approximately 10% of outpatient antibiotics. Fig. 6: 68% of people said that they advised their patient to take a full course of antibiotics and 32% of people did not advise their patients to take a full course of antibiotics. Patients have always been advised to finish their course of antibiotics even if they are feeling better. The reasons given are that this will stop the infection from returning, as well as reduce the risk of the bacteria becoming resistant to the antibiotics. Fig. 7 shows that 64% of people said that they know about the bacteria resistance to antibiotics and 38% of people not known about this. Some bacteria have developed resistance to antibiotics that were once commonly used to treat them, eg: *Staphylococcus aureus*.

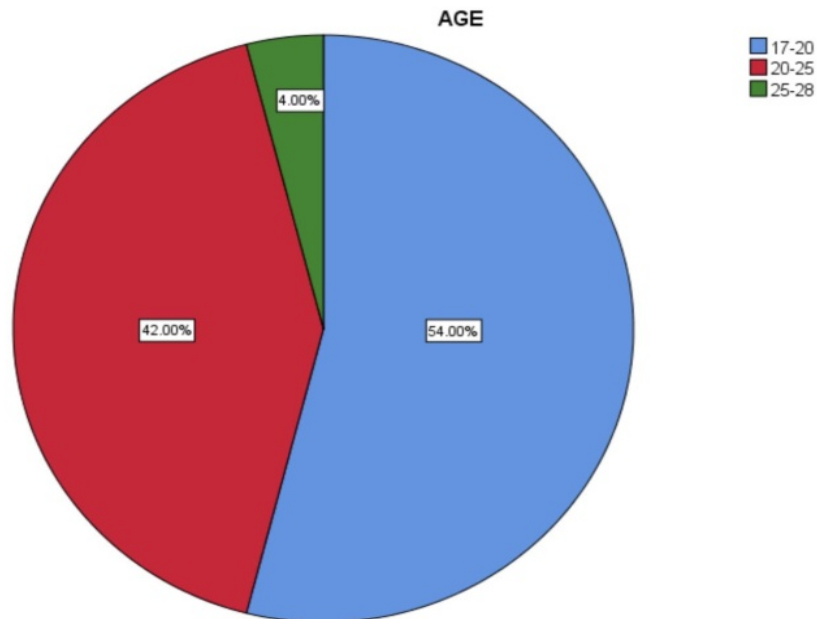


Fig. 1. Depicts the age of the participants. 54% of people from the age group 17-20 (Blue), 42% of people from age group 20-25 (Red) and 4% of people from the age group 25-28 (Green)

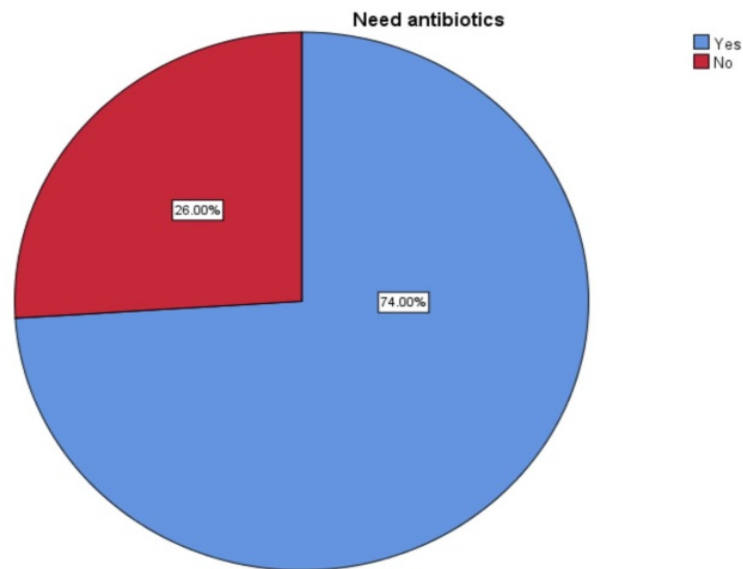


Fig. 2. Depicts the awareness of participants whether there is a need of antibiotics to patients after tooth extraction. 74% of people said that the patients need antibiotics after the tooth extraction (Blue) and 26% of people said that they do not need antibiotics after the tooth extraction (Red)

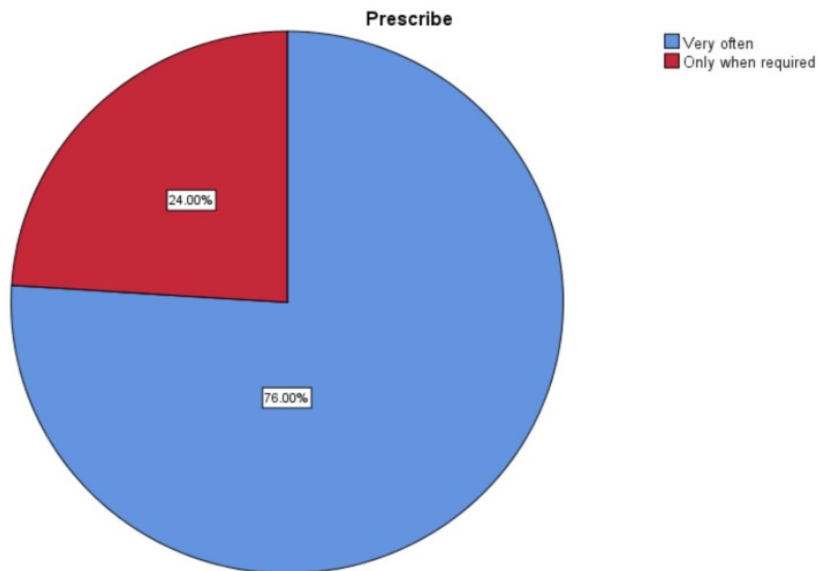


Fig. 3. Depicts how often dentists prescribe antibiotics to their patients. 76% of people said that they very oftenly prescribed antibiotics to their patients (Blue) and 24% of people said that they prescribed antibiotics to their patients only if they required it (Red)

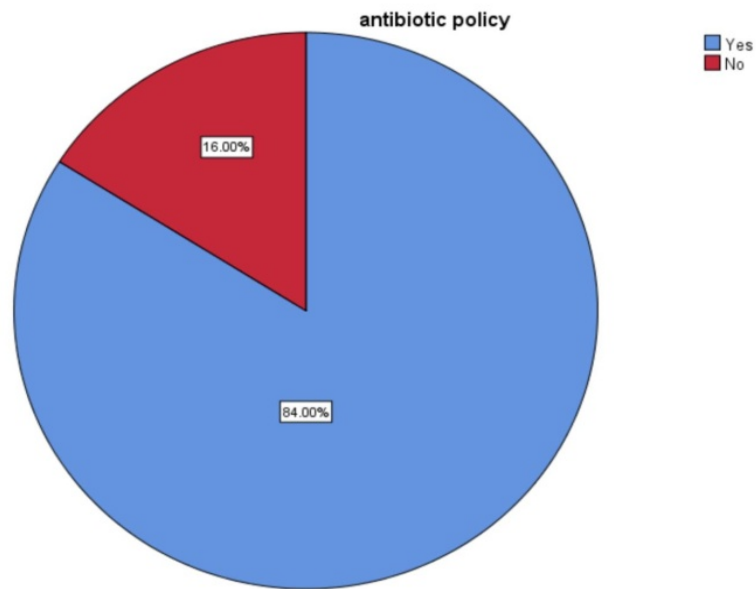


Fig. 4. Depicts the awareness of participants on antibiotic policy. 84% of people were aware about the antibiotic policy (Blue) and 16% of people are not aware about the antibiotic policy (Red)

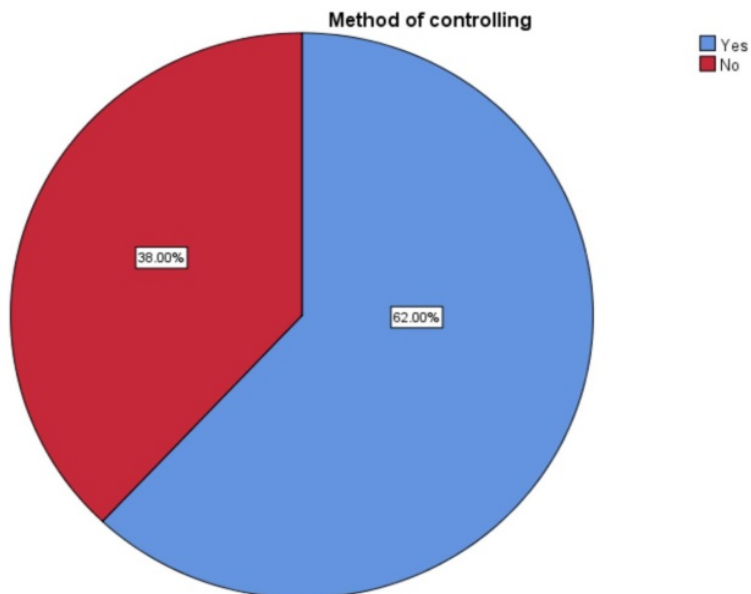


Fig. 5. Depicts the awareness of participants on methods of controlling antibiotic resistance. 62% (Blue) of people are aware about the method of controlling antibiotic resistance and 38% of people are not aware about the method of controlling antibiotic resistance (Red)

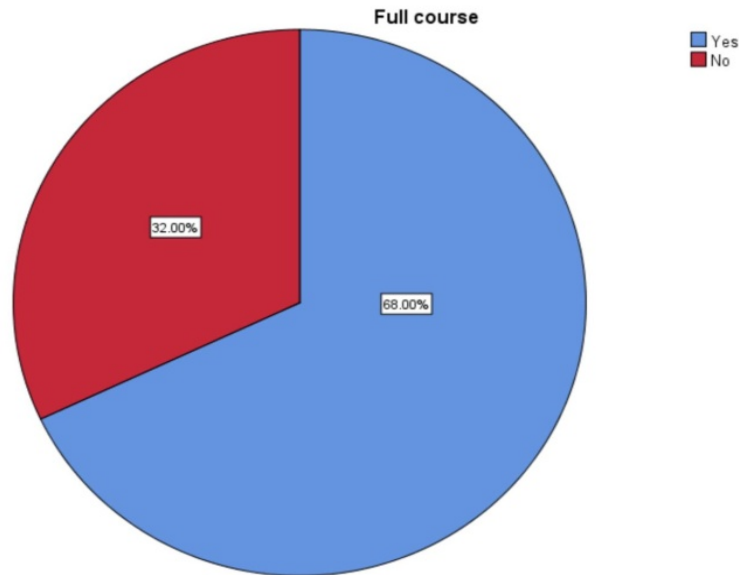


Fig. 6. Depicts the participant’s awareness of patients taking a full course of antibiotics. 68% of people said that they advised their patient to take a full course of antibiotics (Blue) and 32% of people did not advise their patients to take a full course of antibiotics(Red)

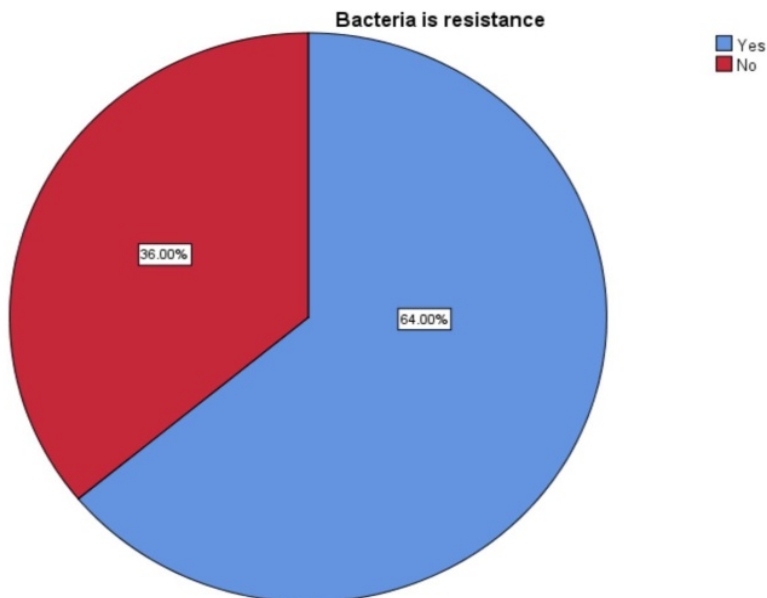


Fig. 7. Depicts the awareness of participants on which bacteria are resistant to antibiotics. 64% of people said that they know about the bacteria resistance to antibiotics (Blue) and 38% of people not known about this (Red)

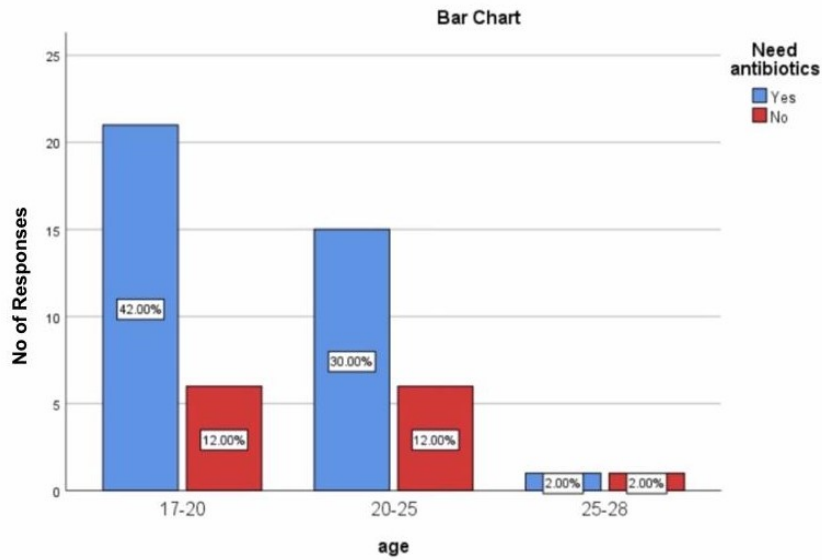


Fig. 8. Depicts the association between age and awareness on the need for antibiotics after tooth extraction. X axis represents the age and Y axis represents the no of responses. Blue colour denotes yes and Red colour denotes no. Chi square test was used to find the association between the variables. Pearson chi square test p value was 0.647(>0.005). The awareness about the need for antibiotics after extraction of teeth is seen more among age group 17 - 20 than others, however it is statistically not significant

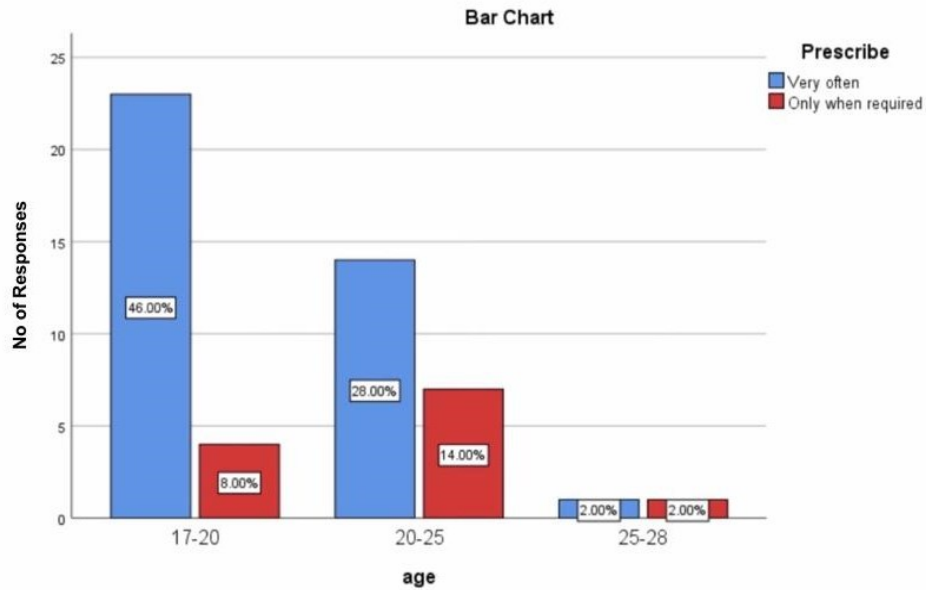


Fig. 9. Depicts the association between age and how often dentists prescribe antibiotics to their patients. X axis represents the age and Y axis represents the no of responses. Blue colour denotes very often and Red colour denotes only when required. Chi square test was used to find the association between the variables. Pearson chi square test p value was 0.224 (>0.005), The students of 17- 20 age group had an opinion that antibiotics are more often prescribed by dentists, however it is statistically not significant

Prescribing is an individualized and dynamic clinical process. It is the act of indicating one or more drugs to be administered to or taken by the patients, drug dose and the duration of the treatment. The prescribing patterns may be influenced by social, cultural, economic and promotional factors [14]. Antibiotic resistance is a direct consequence of antibiotic use. Both continue to escalate despite many calls for moderation of antibiotic use, in the hospital and in the community. Much has been written on antibiotic policies and other control measures. Despite the lack of properly controlled studies, which would be very difficult to perform, there is no doubt that policies can be efficacious in reducing cost and level of use without being detrimental to patients care [15,16,17]. Control of the prevalence of antibiotic-resistance bacteria is essential for the appropriate use of antibiotics for treatment of infection [18].

4. CONCLUSION

Antimicrobial resistance continues to be a significant public health problem in terms of mortality and economic loss. There is an urgent need to develop and strengthen antimicrobial policy, standard treatment guidelines in order to control drug resistant strains. From the present study, it can be concluded that dental students are aware about the antibiotics usage and emerging drug resistance bacteria. Since the present study involved only dental students, further research can be undertaken to assess and compare the knowledge of practitioners on antibiotic usage and emerging drug resistance bacteria.

CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors

ACKNOWLEDGEMENT

We thank saveetha dental college for the support to carry out this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Roda RP, Bagán JV, Bielsa JMS, Pastor EC, Others. Antibiotic use in dental

- practice. A review. *Med Oral Patol Oral Cir Bucal*. 2007;12:186–92.
2. Morcillo E, Cortijo J, Villagrasa V. Pharmacological bases of the antibiotic therapy in odontogenic infections. *Med Oral*. 1996;1:15–23.
3. Al-Mubarak S, Al-Nowaiser A, Rass MA, Alsuwyyed A, Alghofili A, Al-Mubarak EK, et al. Antibiotic prescription and dental practice within Saudi Arabia; the need to reinforce guidelines and implement specialty needs. *J Int Acad Periodontol*. 2004;6:47–55.
4. Al-Haroni M, Skaug N. Knowledge of prescribing antimicrobials among Yemeni general dentists. *Acta Odontol Scand*. 2006;64:274–80.
5. Tong DC, Rothwell BR. Antibiotic prophylaxis in dentistry: A review and practice recommendations. *The Journal of the American Dental Association*. 2000; 131:366–74.
Available:<https://doi.org/10.14219/jada.archive.2000.0181>
6. Marsh PD. Are dental diseases examples of ecological catastrophes? *Microbiology*. 2003;149:279–94.
7. Holbrook WP, Holbrook PW, Kristinsson MJ, Gunnarsdottir S, Briem B. Caries prevalence, *Streptococcus mutans* and sugar intake among 4-year-old urban children in Iceland. *Community Dentistry and Oral Epidemiology*. 1989;17:292–5.
Available:<https://doi.org/10.1111/j.1600-0528.1989.tb00639.x>
8. Chambers HF. Penicillin-binding protein-mediated resistance in pneumococci and staphylococci. *J Infect Dis*. 1999;179(Suppl 2):S353–9.
9. Cvitkovitch DG. Genetic competence and transformation in oral streptococci. *Crit Rev Oral Biol Med*. 2001;12:217–43.
10. Lana MA, Ribeiro-Sobrinho AP, Stehling R, Garcia GD, Silva BK, Hamdan JS, et al. Microorganisms isolated from root canals presenting necrotic pulp and their drug susceptibility in vitro. *Oral Microbiol Immunol*. 2001;16:100–5.
11. Trinh S, Haggoud A, Reysset G. Conjugal transfer of the 5-nitroimidazole resistance plasmid pIP417 from *Bacteroides vulgatus* BV-17: Characterization and nucleotide sequence analysis of the mobilization region. *J Bacteriol*. 1996; 178:6671–6.

12. World Health Organization. Antimicrobial Resistance: Global Report on Surveillance; 2014.
13. Torabinejad MDM, Fouad A, Shabahang S. Endodontics e-book: Principles and practice. Elsevier; 2020.
14. Medeiros M, Guzman-Alvarez, Reyes-Lagunes, Campos-Sepulveda. Knowledge of drug prescription in dentistry students. Drug, Healthcare and Patient Safety. 2012;55. Available: <https://doi.org/10.2147/dhps.s30984>
15. Shlaes DM, Gerding DN, John JF, Craig WA, Bornstein DL, Duncan RA, et al. Society for healthcare epidemiology of America and infectious diseases society of america joint committee on the prevention of antimicrobial resistance: Guidelines for the prevention of antimicrobial resistance in hospitals. Infection Control and Hospital Epidemiology. 1997;18:275–91. Available: <https://doi.org/10.1086/647610>.
16. Swartz MN. Use of antimicrobial agents and drug resistance. N Engl J Med. 1997;337:491–2.
17. Kunin CM. Editorial response: Antibiotic armageddon. Clinical Infectious Diseases. 1997;25:240–1. Available: <https://doi.org/10.1086/514544>
18. Baquero F, the Task Force of the General Direction for Health Planning of the Spanish Ministry of Health. Antibiotic resistance in Spain: What can be done? Clinical Infectious Diseases. 1996;23:819–23. Available: <https://doi.org/10.1093/clinids/23.4.819>

© 2020 Pushpaanjali et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/59694>