



Clinical Relevance of Antibiotic Prophylaxis in Dental Surgical Procedures: A Systematic Review

Ana Vitória Machado Duarte^{a*},
Beatriz Soares Leitão Barbosa^{a,}
Giovana Gisele Costa Oliveira^{a,}
Júlia Maria de Sá Borges^{a,}
Kamila Gregório da Costa Sousa^{a,}
Milleny Ribeiro da Silva Cavalcante^{a,}
Pedro Lucas Rocha dos Santos Araújo^{a,}
Thales Amon Pereira Duarte Rocha^{a,}
Felipe Cardoso Rodrigues Vieira^{b++}
and Stanley Keynes Duarte dos Santos^{b#}

^a *College of Dentistry, Santo Agostinho University Center, Teresina, Brazil.*

^b *Federal University of Piauí, Teresina, Brazil.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors AVMD, GGCO and MRDSA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors BSLB and KGDCS managed the analyses of the study. Authors JMDSB, PLRDSA and TAPDR managed the literature searches. Authors FCRV and SKDDS reviewed the article before submission. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2023/v35i215212

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/106359>

⁺⁺ *Pharmaceutical;*

[#] *Dental Surgeon;*

^{*} *Corresponding author: E-mail: avmduarte@icloud.com;*

ABSTRACT

Background: Antibiotic prophylaxis is a procedure performed with the use of antibiotics to prevent the patient from contracting some type of infection during surgical procedures.

Aim: To analyze the clinical relevance of using antibiotic prophylaxis before dental surgical procedures.

Methods: This is a systematic review of the qualitative literature in the PubMed, LILACS and Medline databases, using the health descriptors "Antibiotic Prophylaxis", "Dentistry" and "Oral Surgical Procedures" and selected articles in English and Portuguese published between 2018 and 2022. Articles that did not follow the eligibility criteria and that did not address relevant data for the present study were excluded. Abstracts were also excluded; duplicate articles; review articles; meta-analysis and studies not related to dentistry.

Results: After the research, considering the inclusion and exclusion criteria and thematic relevance, 15 articles were selected. Upon analysis, it was found that the effect of antibiotic prophylaxis in case of dental surgeries is small and may not be clinically relevant. Some improvement in postoperative symptoms in dental surgeries can be explained by the decrease in bacterial contamination of the surgical wound, and antibiotic prophylaxis is associated with a lower need for analgesic administration. Amoxicillin is considered the antibiotic of choice for antibiotic prophylaxis in clinical dental practice. In cases of penicillin allergy, clindamycin is often prescribed as a substitute of choice, with lower doses of clindamycin when given over shorter periods of time beneficial in relieving pain and reducing postoperative complications.

Conclusion: Regarding the analyzed studies, it appears that the effect of antibiotic prophylaxis in cases of dental surgery may be small and not clinically relevant. In view of this, more studies on the clinical relevance of antibiotic prophylaxis in dental procedures should be carried out and more factors should be addressed in research to increase the scope of analysis.

Keywords: Dentistry; drug therapy; antibiotic therapy; oral surgery.

1. INTRODUCTION

Antibiotics are drugs administered with the aim of controlling or eliminating infections caused by bacteria and are therefore used in clinical practice for prophylactic purposes, preventing the formation and progression of an infection, or for curative purposes, eliminating the established infection [1,2].

In dentally relevant infections, the antibiotic of choice must be effective against broad-spectrum aerobic and anaerobic bacteria, allowing associations with other antimicrobials. In dentistry, they are mainly prescribed in circumstances of acute tooth infection and abscesses; immunosuppressed by systemic changes and surgical procedures; patients affected by liver and kidney disease and for prophylaxis in patients at risk of developing bacterial endocarditis [3,4].

“Antibiotic prophylaxis is a procedure performed with the use of antibiotics to prevent the patient

from contracting some type of infection during surgical procedures [5]. Although the risk of infection after dental surgical procedures is considered low when appropriate techniques are used, treatments that require manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa and root canal procedures are considered invasive” [6,7].

“Despite this, it is observed that in approximately 90% of surgical procedures performed in healthy people (without underlying cardiac conditions), especially in procedures such as third molar extraction, the use of dosages that last up to seven days is considered by some researchers as unnecessary” [8,9,10,11].

There are many gaps in the literature regarding the use of antibiotic prophylaxis in normal systemic patients in dental surgical practice. Therefore, the aim of this study was to analyze the clinical relevance of using antibiotic prophylaxis before dental surgical procedures.

2. MATERIALS AND METHODS

This is a systematic review of the literature of the qualitative type, which is a type of research that enables the search and knowledge on related subjects and the list of opinions of different authors to find answers about the intended objective [12]. This study was based on the following guiding question: Is there clinical relevance in the use of antibiotic prophylaxis before dental surgical procedures?

The search was carried out in PubMed, LILACS and Medline databases using the health descriptors “Antibiotic Prophylaxis”, “Dentistry” and “Oral Surgical Procedures”, with the help of the Boolean operator and being used as follows: “Antibiotic Prophylaxis” and “Dentistry” and “Antibiotic Prophylaxis” and “Oral Surgical Procedures”. Databases gather and organize bibliographic references in a structured way that allow their recovery by interested users [13]. This was carried out from May to June 2023.

Inclusion criteria were a study published in the last 5 years (2018-2022), available free of charge, in Portuguese and English. Articles that did not follow the eligibility criteria and that did

not address relevant data for the present study were excluded. Also excluded were those that are just the abstract; duplicate articles; systematic, systematized, integrative and meta-analysis review articles; studies not related to dentistry [14].

3. RESULTS AND DISCUSSION

In all, 593 publications were retrieved, after careful reading and application of the eligibility criteria, five articles were included in the present review (Fig. 1).

To facilitate understanding, the articles in question were placed in Table 1 containing the author, title, year of publication, journal, and purpose of the study.

The prophylactic use of antibiotics should only be indicated when the benefits outweigh the risks that this therapy offers, such as adverse reactions and selection of resistant microorganisms [15]. The risk of developing bacteremia increases substantially when there is direct contact of the patient's blood with the environment, for example, during surgeries [16].

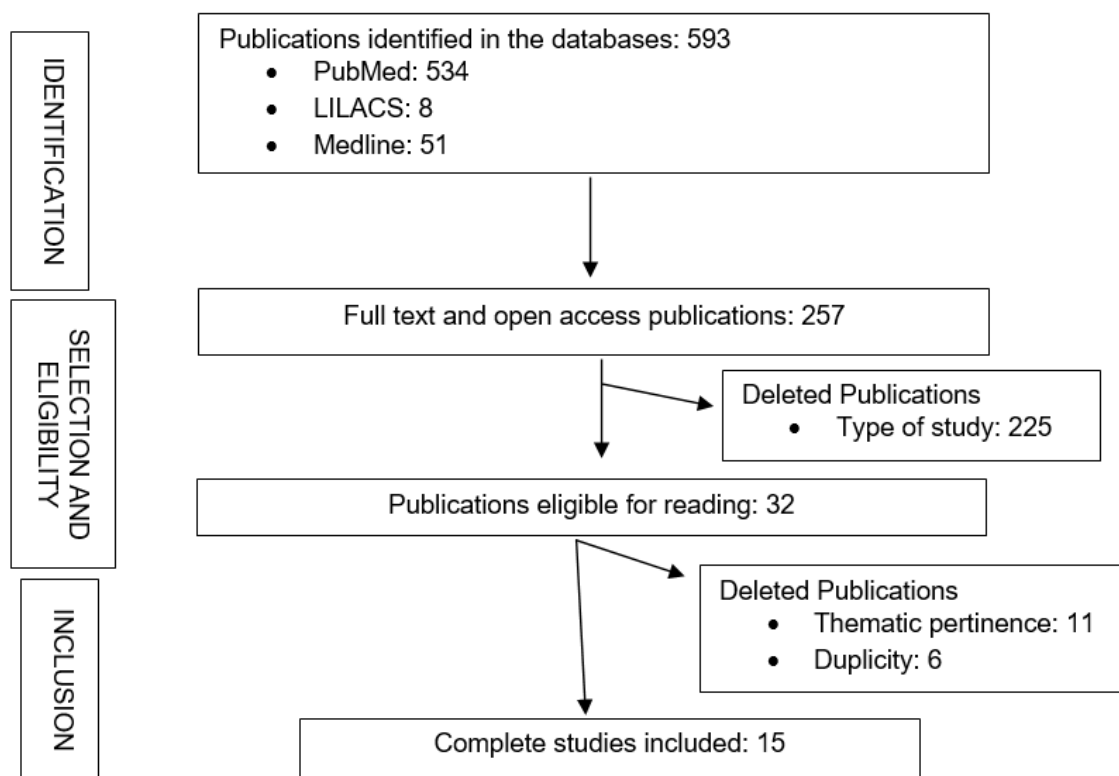


Fig. 1. Flowchart of the article selection process for the integrative review

Table 1. Summary table of the analyzed publications

Nº	Author/Year	Title	Periodical	Aim
1	MOMAND et al. [18].	Effect of antibiotic prophylaxis in dental implant surgery: A multicenter placebo-controlled double-blinded randomized clinical trial.	Clinical Implant Dentistry and Related Research.	To compare the effect of a presurgical antibiotic regimen with an identical placebo regimen in healthy or relatively healthy patients receiving dental implants.
2	YANINE et al. [19].	Effect of antibiotic prophylaxis for preventing infectious complications following impacted mandibular third molar surgery. A randomized controlled trial.	Medicina Oral, Patología Oral y Cirugía Bucal.	Determine the effect of antibiotic prophylaxis in preventing post-operative infections after extraction of impacted mandibular third molars.
3	KIRNBAUER et al. [20].	Is Perioperative Antibiotic Prophylaxis in the Case of Routine Surgical Removal of the Third Molar Still Justified? A Randomized, Double-Blind, Placebo-Controlled Clinical Trial with a Split-Mouth Design.	Clinical Oral Investigations.	Determine whether perioperative antibiotic prophylaxis can reduce surgical site infections, swelling, and pain in the case of surgical removal of wisdom teeth.
4	SANTAMARÍA ARRIETA, G. et al. (2022)	The effect of preoperative clindamycin in reducing early oral implant failure: a randomised placebo-controlled clinical trial.	Clinical Oral Investigations.	To assess the effect of preoperative oral clindamycin in reducing early implant failure in healthy adults undergoing conventional implant placement.
5	JANAS-NAZE, A. et al. [21]	Comparative Efficacy of Different Oral Doses of Clindamycin in Preventing Post-Operative Sequelae of Lower Third Molar Surgery-A Randomized, Triple-Blind Study.	Medicina (Kaunas).	Determine the effect of antibiotic prophylaxis on the prevention of infection and other complications following surgical extraction of impacted mandibular third molars .
6	ZIRK et al. [22]	Oral recipient site infections in reconstructive surgery - impact of the graft itself and the perioperative antibiotics.	Clinical Oral Investigations.	Assess the influence of peri/post-operative antibiotic prophylaxis and the reconstructive graft itself on recipient sites infections in head and neck surgery.
7	KARACAGLAR et al. [23]	Adequacy of Infective Endocarditis Prophylaxis Before	Saudi Journal of Kidney Diseases and	To investigate our local customs and the role of Infective Endocarditis

Nº	Author/Year	Title	Periodical	Aim
		Dental Procedures among Solid Organ Transplant Recipients.	Transplantation.	prophylaxis among our solid organ transplant recipients.
8	CHEN et al. [24]	Risk of Infective Endocarditis After Invasive Dental Treatments.	American Heart Association.	Estimate the association between Invasive Dental Treatments and Infective Endocarditis.
9	BARTELLA et al. [27]	Influence of a strictly perioperative antibiotic prophylaxis vs a prolonged postoperative prophylaxis on surgical site infections in maxillofacial surgery.	Infection.	Compare strictly perioperative antibiotics with an extended postoperative prophylactic antibiotic.
10	THORNHILL et al. [28]	Antibiotic Prophylaxis Against Infective Endocarditis Before Invasive Dental Procedures.	Journal of the American College of Cardiology.	To investigate any association between invasive dental procedures and infective endocarditis, and the effectiveness of Antibiotic prophylaxis in reducing this.
11	CALIENTO et al. [24]	Clinical outcome of dental procedures among renal transplant recipients.	Special Care in Dentistry.	To compare outcomes of dental procedures among a group of renal transplant recipients who had received antibiotic prophylaxis before the procedure and another group that had not received antibiotic prophylaxis.
12	DAN-PING et al. [29]	The effect of preoperative prophylactic antibiotics on dental implants in patients with type 2 diabetes mellitus: 3-5-years retrospective study.	China Journal of Oral and Maxillofacial Surgery.	To evaluate the effect of preoperative antibiotic application on the effect of dental implantation in patients with good controlled blood glucose and mild poor controlled type 2 diabetes mellitus.
13	MOROI et al. [30]	Antibiotic prophylaxis for sagittal split ramus osteotomy using resorbable plate and screw fixation: a randomised trial to compare extended dual-agent and inpatient single-agent regimens.	The British Association of Oral and Maxillofacial Surgeons.	To compare inpatient single-agent and extended dual-agent antibiotic prophylaxis for the prevention of surgical site infections in patients after sagittal split ramus osteotomy.
14	SHUSTER et al. [31]	Short Versus Extended Antibiotic Prophylaxis for Maxillary Sinus Floor Augmentation Via a Lateral Window	The International Journal of Oral & Maxillofacial Implants.	To compare the surgical site infection rate with short (24 hours) vs extended (7 days) antibiotic prophylaxis for maxillary sinus floor augmentation surgery.

Nº	Author/Year	Title	Periodical	Aim
		Approach: A Randomized Controlled Trial.		
15	KASHANI et al. [32]	Influence of a single preoperative dose of antibiotics on the early implant failure rate. A randomized clinical trial.	Clinical Implant Dentistry and Related Research.	To compare the early implant failure rates in two different patient cohorts.

Source: Own Authorship, 2023

“In oral and maxillofacial surgeries, infection in surgical center is a common complication and some factors such as duration of surgery, wound class, American Society of Anesthesiology classification of the patient and his medical history determine its occurrence. Therefore, it is essential to carry out a good anamnesis in order to determine whether or not the patient needs antibiotic prophylaxis” [17].

“The scientific basis for determining which antibiotic has the best effect in preventing postoperative infection in the oral cavity is still insufficient. However, since approximately 90% of the oral microbiota in immunosuppressed patients are sensitive to penicillin, amoxicillin is considered the antibiotic of choice” [18].

“As for the association between the use of antibiotics and the improvement of postoperative symptoms in dental surgeries, it can be explained by the decrease in bacterial contamination of the surgical wound, reducing inflammatory mediators and reducing the need for analgesics to be administered by patients after dental surgeries” [19].

“The preoperative antibiotic prophylaxis in the routine surgical removal of third molars without signs of local inflammation is unnecessary, provided that advanced hygiene guidelines are observed and that dentists ensure a smooth intraoperative period, reducing surgical time and the risks of infections” [20].

A study indicates that “lower doses of clindamycin, when administered for shorter periods, are beneficial in relieving pain and reducing postoperative complications after surgical removal of third molars” [21].

“Ampicillin/sulbactam, cephalosporines and clindamycin are among the most common agents administered as peri/post-operative antibiotic prophylaxis in head and neck surgery” [22].

“The most used antibiotic was amoxicillin and there were no complications in both antibiotic prophylaxis and no-prophylaxis groups. Although administering antibiotic prophylaxis do not change infectious complications, clinicians seem to be prone to antibiotic prophylaxis for dental procedures” [23-27].

“A significant temporal association is demonstrated between invasive dental procedures (particularly extractions and oral surgical procedures) and subsequent infective endocarditis in high-risk individuals. Furthermore, a significant relationship is demonstrated between the use of antibiotic prophylaxis and reduced incidence of infective endocarditis after these procedures, data which support the recommendations of the American Heart Association” [28].

Prophylactic use of antibiotics before dental implantation surgery cannot improve wound healing, long-term survival rate and marginal bone loss. There is a lack of evidence to support the necessity of systemic antibiotic prophylaxis in type 2 diabetes mellitus patients with good and mild poorly controlled blood glucose [29].

“It is suggested that inpatient single-agent postoperative antibiotic regimen is sufficient to prevent surgical site infections in sagittal split ramus osteotomy patients with resorbable plate and screw fixation” [30].

A low rate of surgical site infection was observed after augmentation of the maxillary sinus floor, and there was no apparent advantage of prolonged (7 days) versus short (24 hours) duration of antibiotic prophylaxis, not justifying the prolonged use of antibiotic prophylaxis in patients submitted to maxillary sinus floor augmentation surgery [31].

“It is demonstrated that administering a single dose of antibiotics in conjunction with implant

placement surgery resulted in a statistically significantly lower early implant failure rate compared to when no antibiotics were used” [32].

The number of articles found in this study and the period of publication of these articles show that research associated with the topic of antibiotic prophylaxis prior to dental surgical procedures is recent and still needs further study by the scientific and academic community. In view of the importance that bacterial infections assume in the dental clinic, antibiotic prophylaxis studies should be conducted more frequently by dentists.

4. CONCLUSION

For all the above, in relation to the clinical relevance of using antibiotic prophylaxis before dental surgical procedures, it can be concluded that the effect of antibiotic prophylaxis in the case of surgeries, such as dental implants, is small and may not be clinically relevant.

In addition, some improvement in postoperative symptoms in dental surgeries can be explained by the decrease in bacterial contamination of the surgical wound, and antibiotic prophylaxis is associated with a lower need for analgesic administration. Amoxicillin is considered the antibiotic of choice for antibiotic prophylaxis in clinical dental practice. In cases of penicillin allergy, clindamycin is often prescribed as a substitute of choice, with lower doses of clindamycin when given over shorter periods of time beneficial in relieving pain and reducing postoperative complications.

It is inferred, therefore, that more clinical studies on the clinical relevance of antibiotic prophylaxis in necessary dental procedures should be carried out so that more clinical data can be extracted and analyzed by dental research.

The study had limitations in relation to the number of studies returned in the search in the database, taking into account the theme and the criteria used. In addition, it is recommended that future research address associated factors, such as: a) age of the patient, b) general state of health of the patient, c) type and time of administration of antibiotics, d) type of dental procedure, e) oral hygiene habits, and f) eating habits.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Gonzalez- Martinez R, Cortele- Ballester I. Antibiotic prescription in the treatment of odontogenic infection by health professionals: A factor to consensus. *Med Oral Patol Oral Cir Bucal*. 2001;17(3): e452- 6.
2. Pallasch TJ. Pharmacokinetic principles of antimicrobial therapy. *Periodontol*. 2000; 10:5-11.1996.
3. Bascones Martinez A, Aguirre JM, Bermed A, Blanco A, Gay-Escoda C, Gonzales-Moles MA, et al. Consensus statement on antimicrobial treatment of odontogenic bacterial infections. *Med Oral Patol Oral Cir Bucal*. 2004;9:363-76.
4. Montgomery E. Agentes antimicrobianos na prevenção e tratamento das infecções. In: Yagiela JÁ, Neidle EA, Dowd FJ. *Farmacologia e terapêutica para dentistas*. 4o ed. Rio de Janeiro: Guanabara Koogan. 2000;597-606.
5. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al. American Society of Health-System Pharmacists; Infectious Disease Society of America; Surgical Infection Society; Society for Healthcare Epidemiology of America. Clinical practice guidelines for antimicrobial prophylaxis in surgery. *Am J Health Syst Pharm*. 2013 Feb 1;70(3):195-283.
6. Segura-Egea JJ, Gould K, Şen BH, Jonasson P, Cotti E, Mazzoni A, Sunay H, Tjäderhane L, Dummer PMH. European Society of Endodontology position statement: The use of antibiotics in endodontics. *Int Endod J*. 2018 Jan;51(1): 20-25.
7. Khouly I, Braun RS, Chambrone L. Antibiotic prophylaxis may not be indicated for prevention of dental implant infections in healthy patients. A systematic review and meta-analysis. *Clin Oral Investig*. 2019 Apr;23(4):1525-1553.
8. Arteagoitia I, Rodríguez-Andrés C, Rodríguez-Sánchez F. Antibiotic prophylaxis habits in dental implant

- surgery among dentists in Spain. A cross-sectional survey. *Med Oral Patol Oral Cir Bucal*. 2018 Sep 1;23(5):e608-e618.
9. Mariscal-Cazalla MDM, Manzano-Moreno FJ, García-Vázquez M, Vallecillo-Capilla MF, Olmedo-Gaya MV. Do perioperative antibiotics reduce complications of mandibular third molar removal? A double-blind randomized controlled clinical trial. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2021 Mar;131(3):286-294.
 10. Suda KJ, Henschel H, Patel U, Fitzpatrick MA, Evans CT. Use of Antibiotic Prophylaxis for Tooth Extractions, Dental Implants, and Periodontal Surgical Procedures. *Open Forum Infect Dis*. 2017 Nov 15;5(1):ofx250.
 11. Yalcin-Ülker GM, Cakir M, Meral DG. Antibiotic prescribing habits of the clinicians dealing with dental implant surgery in Turkey: a questionnaire study. *Int J Implant Dent*. 2020 Sep 27;6(1):66.
 12. Brasil. Ministério da Saúde. Secretaria de Gestão do Trabalho e da Educação na Saúde. Revisão de Literatura 2019;19(4): 81-99.
 13. Brasil. Ministério da Saúde. Secretaria de Gestão do Trabalho e da Educação na Saúde. Revisão de Literatura 2019;19(4): 85.
 14. Duarte AV, da Silva Rodrigues AB, Oliveira GG, de Oliveira Sá I, Dal Prá JD, de Moura Bezerra JV, et al. Epidemiological aspects and oral implications of Paracoccidioidomycosis infection: An integrative review. *Brazilian Journal of Implantology and Health Sciences*. 2023 Aug 16;5(4):523-38.
 15. Teoh L, Cheung MC, Dashper S, James R, McCullough MJ. Oral antibiotic for empirical management of acute dentoalveolar infections-a systematic review. *Antibiotics (Basel)Switz*. 28 de fevereiro de 2021;10(3):240.
 16. Glenny A-M, Oliver R, Roberts GJ, Hooper L, Worthington HV. Antibiotics for the prophylaxis of bacterial endocarditis in dentistry. *Cochrane Oral Health Group, organizador. Cochrane Database Syst Rev*. 2013;10:CD003813.21.
 17. Moreira A, Andrade ED de. Estudo prospectivo da incidência de infecção em cirurgias de terceiros molares retidos: o papel da profilaxia antibiótica. *RGO Rev Gaúcha Odontol*. 2011;59(3):357-64.
 18. Momand P, Becktor JP, Naimi-Akbar A, Tobin G, Gotrick B. Effect of antibiotic prophylaxis in dental implant surgery: A multicenter placebo-controlled double-blinded randomized clinical trial. *Clin Implant Dent Relat Res*. 2022;24(1):116–24.
 19. Yanine N, Sabelle N, Vergara-Gárate V, Salazar J, Araya-Cabello I, Carrasco-Labra A, et al. Effect of antibiotic prophylaxis for preventing infectious complications following impacted mandibular third molar surgery. A randomized controlled trial. *Med. Oral Patol. Oral Cirugía Bucal*. 2021; 26:e703–e710.
 20. Kirnbauer B, Jakse N, Truschneegg A, Dzidic I, Mukaddam K, Payer M. Is Perioperative Antibiotic Prophylaxis in the Case of Routine Surgical Removal of the Third Molar Still Justified? A Randomized, Double-Blind, Placebo-Controlled Clinical Trial with a Split-Mouth Design. *Clin. Oral Investig*. 2022;26:6409–6421.
 21. Janas-Naze A, Torbicka G, Chybicki D, Lipczyńska-Lewandowska M, Zhang W. Comparative Efficacy of Different Oral Doses of Clindamycin in Preventing Post-Operative Sequelae of Lower Third Molar Surgery-A Randomized, Triple-Blind Study. *Medicina (Kaunas)*. 2022;17;58(5):668.
 22. Zirk M, Zalesski A, Peters F, Kreppel M, Zinser M, Zöller JE. Oral recipient site infections in reconstructive surgery-impact of the graft itself and the perioperative antibiotics. *Clinical Oral Investigations*. 2020;24:1599-1605.
 23. Karacaglar E, Akgun A, Ciftci O, Altiparmak N, Muderrisoglu H, Haberal M. Adequacy of infective endocarditis prophylaxis before dental procedures among solid organ transplant recipients. *Saudi Journal of Kidney Diseases and Transplantation*. 2019;30(4):764-768.
 24. Chen TT, Yeh, YC, Chien KL, Lai MS, Tu YK. Risk of infective endocarditis after invasive dental treatments: case-only study. *Circulation*. 2018;138(4):356-363.
 25. Caliento R, Sarmiento DJDS, Kobayashi-Velasco S, de Sá SNC, Shibutani PP, Gallotini M. Clinical outcome of dental procedures among renal transplant recipients. *Special Care in Dentistry*. 2018; 38(3):146-149.
 26. Ghantous Y, Araidy S, Yaffe V, Mirochnik R, El-Raziq MA, El-Naaj IA. The efficiency of extended postoperative antibiotic prophylaxis in orthognathic surgery: A prospective, randomized, double-blind, placebo-controlled clinical trial. *J*

- Craniomaxillofac Surg. 2019;47(2):228-232.
27. Bartella AK, Lemmen S, Burnic A, Kloss-Brandstätter A, Kamal M, Breisach T, Lethaus B. Influence of a strictly perioperative antibiotic prophylaxis vs a prolonged postoperative prophylaxis on surgical site infections in maxillofacial surgery. *Infection*. 2018;46:225-230.
28. Thornhill MH, Gibson TB, Yoon F, Dayer MJ, Prendergast BD, Lockhart PB, Baddour LM. Antibiotic prophylaxis against infective endocarditis before invasive dental procedures. *Journal of the American College of Cardiology*. 2020;80(11):1029-1041.
29. Dan-ping R, Yi-chen Y, Si-nan D, Yuan-yuan Z, Chun-yun WU. The effect of preoperative prophylactic antibiotics on dental implants in patients with type 2 diabetes mellitus: 3-5-years retrospective study. *China Journal of Oral and Maxillofacial Surgery*. 2020;18(3):231.
30. Moroi A, Saito Y, Takayama A, Yoshizawa K, Ueki K. Antibiotic prophylaxis for sagittal split ramus osteotomy using resorbable plate and screw fixation: A randomised trial to compare extended dual-agent and inpatient single-agent regimens. *Br J Oral Maxillofac Surg*. 2021;59(5):586-591.
31. Shuster A, Kleinman S, Reiser V, Ianculovici C, Peleg O, Ben-Ami R. Short Versus Extended Antibiotic Prophylaxis for Maxillary Sinus Floor Augmentation Via a Lateral Window Approach: A Randomized Controlled Trial. *Int J Oral Maxillofac Implants*. 2021;36(5):992-998.
32. Kashani H, Hilon J, Rasoul MH, Friberg B. Influence of a single preoperative dose of antibiotics on the early implant failure rate. A randomized clinical trial. *Clin Implant Dent Relat Res*. 2019; 21(2):278-283.

© 2023 Duarte 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:
<https://www.sdiarticle5.com/review-history/106359>