Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/12638
DOI URL: http://dx.doi.org/10.21474/IJAR01/12638

RESEARCH ARTICLE

ENDOCARDITIS PROPHYLAXIS IN DENTAL PRACTICE: EVALUATION OF KNOWLEDGE AMONG DENTISTS, AND CARDIOLOGISTS

Abdoul Hafizou Rabe[1], Latifa Benrachadi[2] and Bassima Chami[3]

1. Resident Dentist in Dentofacial Orthopedics, Mohammed V University in Rabat, Faculty of Dentistry-Rabat, avenue Mohammed El Jazouli, BP 6212 Madinat Al Irfane, Rabat, Morocco.
2. Professor of higher Education in Periodontology, Mohammed V University in Rabat, Faculty of Dentistry-Rabat-Morocco.
3. Professor of higher Education in Oral Surgery, Mohammed V University in Rabat, Faculty of Dentistry-Rabat-Morocco.

Manuscript Info

Manuscript History
Received: 25 January 2021
Final Accepted: 28 February 2021
Published: March 2021

Key words:-
Infective Endocarditis, Antibiotic Prophylaxis, Dental Procedures, Dentist's Knowledge, Cardiologist's Knowledg

Abstract

Background: Infective endocarditis (IE) is a rare condition that is associated with considerable morbidity and mortality. Almost 100 years ago, the links between endocarditis and procedures, particularly dental procedures, were postulated. Over 50 years ago the first guidelines recommending antibiotic prophylaxis (AP), with the aim of preventing IE from developing after dental procedures, were proposed.

Objective: This study aimed to assess the degree of knowledge about endocarditis prophylaxis (EP) among cardiologists, and dentists, and to identify the areas of knowledge that require attention

Methods: We conducted a cross-sectional study of 43 cardiologists and 87 dentists in the city of Rabat. Respondents completed a questionnaire to evaluate their knowledge of EP after signing their informed consent. Data were examined through analysis of variance using the chi-squared test (X^2) and Fisher's exact test to test the significance of the differences between proportions.

Findings: 53.5% of cardiologists report following the European Society of Cardiology (ESC) against 62.1% of dentists refer to the French Agency for Health Product Safety (FAHPS), 27.9% of cardiologists are aware of cardiac conditions with a high risk of IE compared to 75.9% of dentists. 2.3% of cardiologists are aware of invasive oral procedures against 54% for dentists. 69% of cardiologists and 70% of dentists have a correct antibiotic prophylaxis prescription regime. 4.7% of cardiologists and 24.1% of dentists know the meaning of spontaneous bacteremia.

Conclusion : Both groups had inadequate knowledge of dental procedures. Dentists showed a greater knowledge of heart disease requiring prophylaxis in dental practice. It is thus necessary to reinforce EP knowledge in undergraduate and postgraduate programs and to encourage dentists and cardiologists to keep up-to-date on this issue.

Corresponding Author:- Abdoul Hafizou Rabe
Address:- Resident Dentist in Dentofacial Orthopedics, Mohammed V University in Rabat, Faculty of Dentistry-Rabat, avenue Mohammed El Jazouli, BP 6212 Madinat Al Irfane, Rabat, Morocco.

Introduction:-

Infective endocarditis (IE) is a rare, potentially life-threatening infection of the heart valves or endocardium, and it is often found in association with congenital or acquired cardiac defects. Despite advances in IE diagnosis, antimicrobial therapy, surgical techniques, and the management of complications, high morbidity and mortality rates continue to be associated with this infection. The basic pathology of IE involves turbulent blood flow produced by certain types of congenital or acquired heart disease that can traumatize the endothelium, resulting in the deposition of platelets and fibrin on the damaged endocardium or endothelial surface (1,2).

The link between IE and dental care procedures has been known for a long time and has led to a consensus of recommendations based on the principle of antibiotic prophylaxis (AP) (3).

However, the modality and indications of antibiotic prophylaxis have evolved continuously since the publication of the first recommendations in 1955 by American Heart Association (AHA) (4) until the publication of the latest recommendations of French National Agency for Drug Safety (ANSM) in 2011(5) and the European Society of Cardiology in 2015 (6).

Indeed, after an ascending phase during which antibiotic prophylaxis was systematic and its indications progressively extended, a descending phase began, and antibiotic prophylaxis was maintained only for patients at high risk of IE (table 1) and in dental procedures involving manipulation of the periapical region or gingival tissue or perforation of the oral mucosa (4-6). On the other hand, although some dental procedures and specific heart problems are recognized as an indication for AP in IE prevention, there is some controversy over other dental treatments as to whether or not they require prophylaxis (3).

Table 1:- Modified from guidelines for endocarditis prophylaxis (4-6).

Cardiac conditions at high risk of IE
• Prosthetic cardiac valve or prosthetic material used for cardiac valve repair • Previous IE • Congenital heart disease (CHD)* Unrepaired cyanotic CHD, including palliative shunts and conduits Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure‡ Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization) • Cardiac transplantation recipients who develop cardiac valvulopathy

* Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD.

‡ Prophylaxis is reasonable because endothelialization of prosthetic material occurs within 6 months after the procedure.

Table 2:- Regimens for a dental procedure (4).

Situation	Agent	Regimen: single dose 30 to 60 min before procedure	
		Adults	Children
Oral	Amoxicillin	2g	50mg/kg
Unable to take oral medication	Ampicillin or cefazolin or ceftriaxone	2g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin-oral cephalexin*,‡	Cephalexin*†OR Clindamycin or Azithromycin or Clarithromycin	2 g 600 mg 500 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg 15 mg/kg
Allergic to penicillins or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone‡ or Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV

IM = indicates intramuscular; IV = intravenous.
* Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
‡ Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.

Even though expert groups such as AHA, or ESC periodically issue specifications on antibiotic regimens and use indications (table 2), many oral health professionals and cardiologists are confused about the indication or type of antibiotic prophylaxis, and often base their decision on recommendations from prudent practitioners who rely on their own experiences and suggest prophylaxis in unpromising situations (7,8).

This study aimed to assess the knowledge and practices of cardiologists and dentists regarding the application of recommendations for the prevention of infective endocarditis.

Materials and Methods:-

Description of the study

The design is cross-sectional and the study included all the senior students, residents, and specialists in dentistry and cardiology who agreed to answer a questionnaire.

The questionnaire consisted of three parts; the first gathered demographic data (gender, age, and years of graduation), the second analyzed the respondents' knowledge about expert groups, and the third evaluated respondents' knowledge about AP use, dose/ medication, and associated heart conditions.

In the question of dental procedures participants should select the dental procedures in which AP is necessary or not necessary, and then tested their knowledge about the current guidelines based on ANSM, National Institute for Health and Clinical Excellence guidelines (NICE), AHA, and ESC guidelines.

The dose/medication section evaluated the participants' knowledge of the drug of choice for AP (amoxicillin), the adequate dose (50 mg/kg), and the optimum time for AP prescription (one hour before a dental procedure).

The section on heart condition tested the respondents' knowledge about the kind of diseases in which AP is necessary, as well as the heart condition which is at most risk for the development of IE after a dental procedure.

Statistical analysis

All analyses were performed using IBM SPSS, version 10.0. To evaluate the degree of knowledge of both groups in the different domains proposed in the questionnaire, the chi-square test (SAS 9.2, SAS Institute Inc Cary, NC) was used. Differences were considered significant if $p<0.05$.

Findings

Demographics

The study population included 43 cardiologists and 87 dentists. The most represented age group was under 35 years of age (90.7%) for cardiologists and (80.5%) for dentists. There were as many women as men among cardiologists (M/F sex ratio of 1) while women outnumbered men four to one (sex ratio of 1/4). As shown in Table 3, most of the respondents were working in public hospital.

Table 3:- Demographic characteristics of participants (%).

	Cardiologists	Dentists
Gender		
Men	41,90%	19,50%
women	58,10%	80,50%
Ages		
<35 ans	90,70%	80,5%
>35 ans	9,3%	19,50%
Types of exercise		
Public Hospital	97,7%	69%
Private Hospital	2,3%	31%

Recommendations followed:-

Most of the cardiologists (53.5%) were following the European Society of Cardiology guidelines (ESC), 11.6% were following the American Heart Association guidelines(AHA), 16.3% were following ANSM guidelines, 16.3% were following both AHA and ESC guidelines, and 2.3% were following AHA+ ANSM +ESC guidelines. The majority of dentists (62.1%) had followed ANSM guidelines, 20.70% AHA and ANSM guidelines, 16.10% AHA guidelines, and 1.10% were following AHA guidelines, ANSM and ESC guidelines (Figure 1).

Figure 1: Recommendations followed by cardiologists and dentists

The lack of knowledge of the cardiologists' last recommendation date was 100% for ANSM, 86% for AHA, and 48.8% for ESC. As for dentists, this rate was 39.1% for FASHP, 83.9% for AHA, and 100% for ESC recommendations (figure 2).

Figure 2: The lack of knowledge of last recommendation date by the two professions

Cardiologists get information from fellow cardiologists 25.6%, from congresses 18.6%, and other ways 55.8%. For dentists, the most cited sources of information are faculty courses 37.9%, congresses, and other 20.7%, fellow dentists, and congresses 17.2%.

knowledge on endocarditis prophylaxis (EP)

We stratified the knowledge on EP into three areas: heart condition, dental procedures, and dose/medication.

In the heart condition, it was asked to assess the risk of IE associated with nine heart diseases of which three are at high risk of IE, namely the history of IE, valve prosthesis, and cyanogenic congenital heart disease. It appears that 27.9% of cardiologists recognize cardiac pathologies at high risk of AE against 75.9% of dentists, 48.8% of cardiologists wrongly consider valvular diseases at high risk of AE against 13.8% of dentists, and finally, 39.5% of cardiologists wrongly considered wearing a pacemaker to be a high risk of IE (table 4).

Tableau 4:- Knowledge of the two professions of heart disease at high risk of IE.

Cardiopathies à haut Risque d'EI	Cardiologues N(%)	Dentistes N(%)	P
Prothèse valvulaire	41(95,3%)	85(97,7%)	0,465
Antécédent d'EI	39(90,7%)	83(95,4%)	0,294
Cardiopathies congénitales Cyanogènes	31(72,1%)	80(92%)	0,003

Moreover, pathologies at high risk of IE, taken individually, were well recognized by the two medical professions, but significantly better by dentists than for cyanogenic congenital heart disease (Table 4).

Table 5:- Knowledge of non-risk pathologies by both professions.

Pathologies non à risque	Cardiologues n(%)	Dentistes n(%)	P
HTA	43(100%)	87(100%)	>0,05
valvulopathie	21(48,8%)	12(13,8%)	<0,001

For the identification of non-risk heart disease, 21 (48.8%) of cardiologists mistakenly considered valve disease as a high risk of AE against 12 (13.8%) dentists, with a statistically significant difference between the two occupations (Table 5).

In the dental procedure area, 51.2% of cardiologists knew the correct definition of an invasive act that it was an act causing significant bacteremia according to the current definition, 30.2% reported that it is a bloody act, 9.3% associated the first two responses, and 9.3% said they do not know. As for dentists, only 31% found the correct definition of an invasive act, which was an act causing significant bacteremia.

Concerning the knowledge of invasive procedures, there is a statistically significant difference between both professions (table 6).

Table 6:- Knowledge of invasive procedures by both professions.

Invasive procedure	Cardiologists n(%)	Dentists n(%)	P
Devitalization of dental Pulp with one root canal	24(55,8%)	73(83,9%)	<0,001
Teeth scaling	13(30,2%)	83(95,4%)	<0,001
Dental avulsion	24(55,8%)	85(97,7%)	<0,001

In the dose/medication area, the proportion of correct answers between cardiologists (74,4%) and dentists (70,1%) showed no significant differences. The antibiotic most prescribed for allergic to penicillin is clindamycin 51.10% (cardiologists) and 55,17% (dentists) (fig 3).

Figure 3: Proportion of responses in the dose/medication area by both groups.

Discussion:-

The prevention of infective endocarditis (IE) in patients with high-risk cardiac conditions by dentists requires collaboration with the attending physician and, above all, knowledge of the means of preventing AR.

This prevention is achieved by maintaining optimal oral hygiene and the restoration of the oral cavity to reduce spontaneous bacteremia, as well as the prescription of antibiotic prophylaxis before any invasive procedure likely to lead to transient induced bacteremia (3).

Antibiotic prophylaxis in dental care has long been controversial and there is still confusion about its effectiveness (9).

As a result, prophylactic treatment varies considerably from country to country throughout the world (10), and the most common guidelines are those American Heart Association (AHA), French National Agency for Drug Safety (ANSM), the European Society of Cardiology (ESC), the British Society of Anti-Infectious Chemotherapy (BSAC), and the National Institute for Health and Clinical Excellence (NICE) (10,11).

These guidelines continue to be updated based on newly published evidence and this has an impact on cardiac conditions and the different types of procedures that require antibiotic prophylaxis (5,6).

It is imperative that every dentist and cardiologist be aware of the latest recommendations for optimal management of high-risk cardiac conditions.

The results of this study showed a very low knowledge of cardiologists and average knowledge of dentists regarding both high-risk types of heart disease and oral procedures.

Knowledge of learned societies:

Knowledge of guidelines and their possible updates are necessary for the prevention of infective endocarditis (IE) in patients with high-risk cardiac conditions during oral care.

The results of the study showed that 53.5% of cardiologists followed the ESC but only 51.2% knew the date of the last updates of this association. While 62.1% of dentists followed the ANSM, and 60.9% recognized the date of its latest recommendations.

In another study, Fifty-seven percent of the dentists correctly mentioned the appropriate publication date of the current guidelines (ANSM 2011) (12).

Field risk assessment:

While exact knowledge of the three high-risk cardiac conditions is better for dentists (75.9%) versus (27.9%) for cardiologists, awareness of high-risk cardiac conditions taken separately is better for both cardiologists 86.03% and dentists 95.03%. There is also a degree of lack of knowledge of non-high-risk situations in both professional groups, especially for valvulopathy, which is wrongly considered high-risk by 48.8% of cardiologists and 13.8% dentists.

This lack of knowledge has consequences, particularly in terms of the indication for unjustified antibiotic prophylaxis prescriptions. That would be mainly related to the lack of updating of knowledge on recommendations, having fellow cardiologists as a source of information for 25.6% of cardiologists, and former classes in the faculty for 37.90% of dentists.

According to a national survey conducted in France by Cloitre et al. (12), only 13% of dentists know properly assess cardiac conditions requiring antibiotic prophylaxis. This rate rises to 32% in a study conducted by Santhosh et al. in India (13) and is 52.6% in a study conducted in Saudi Arabia by Afnan et al. (14)

Concerning cardiologists, a national survey of French cardiologists conducted in 2015 by Trochu et al. (15) reported that more than 93% of cardiologists were aware of cardiac conditions at high risk of IEs.

Risk assessment of oral gestures.
Overall, dentists (54%) better identify specific invasive oral procedures than cardiologists (2.3%). That is due to dentists' familiarity with these procedures. However, there is some confusion about the definition of an invasive procedure, which is a procedure that causes significant bacteremia and is not limited to a bloody process, as suture removal may be bloody but not intrusive. The consequences will be an under-prescription of antibiotic prophylaxis in the context and an over-prescription in the case of non-invasive procedures, much more in cardiologists than in dentists.

In 2013, Bhayat et al. (16) reported 84% of the dentists' correct responses and less than 50% of cardiologists correct answers.

Prevention of Infectious Endocarditis
First-line antibiotic prophylaxis consists, for more than 69% of cardiologists and more than 70% of dentists, of a single administration of amoxicillin, one hour beforehand, following the new American and French European recommendations (4,6).

In allergic to penicillin, 51.10% of cardiologists and 55.17% of dentists prescribe clindamycin, as being the recommended molecule. However, 20.9% of cardiologists and 24.13% of dentists continue to prescribed pristinamycin even it is no longer the recommended drug as of 2011.

Afnan et al. (14) in 2016 reported that 63.9% of dentists prescribe amoxicillin as first-line therapy.

The Santhosh et al. study in 2016 in India (13) showed a result among dentists of 56% compliant prescribing of antibiotic prophylaxis for IE, and 25% compliant prescribing of clindamycin as a second-line treatment.

Trochu Q et al. (15) found that 47% of cardiologists in France have a compliant prescription.

Conclusion:-

Patients with cardiac conditions at risk for IE often visit the dental office and undergo care that may affect their overall health.

The management of these patients requires a thorough knowledge of the new recommendations for IE prophylaxis by cardiologists and dentists.

This study assessed the knowledge of current recommendations to cardiologists and dentists regarding the management of these patients. The results of this study revealed a lower level of awareness among cardiologists than dentists for the prevention of AR in oral healthcare and a tendency for incorrect and over-prescribing of antibiotics.

Therefore, it is necessary to inform cardiologists and dentists of the need to update their understanding of prophylaxis to ensure adequate management without the risk of bacterial resistance and allergic reactions through close collaboration between the cardiologist and the dentist.

Abbreviations
IE: Infective Endocarditis

AP: Antibiotic Prophylaxis
EP: endocarditis prophylaxis
ESC: European Society of Cardiology
FAHPS: French Agency for Health Product Safety
AHA: American Heart Association
NICE: National Institute for Health and Clinical Excellence guidelines.

Competing Interests
The authors have no competing interests to declare.

Author Contributions
Conceived and designed the study: AHR and BC. Analyzed the data: BC. Contributed reagents/ materials/analysis tools: AHR, BC and LB. Wrote the paper: AHR and BC.

References:-

1. Jain P, Stevenson T, Sheppard A, Rankin K, Compton SM, Preshing W, et al. Antibiotic prophylaxis for infective endocarditis: Knowledge and implementation of American Heart Association Guidelines among dentists and dental hygienists in Alberta, Canada. J Am Dent Assoc. 2015;146:743–50
2. Hill.E.E, Herijgers.P, Herregods.M.C et al. Evolving trends in infective endocarditis. Clin Microbiol infect 2006 ;12(7) :5-12.
3. Boukais.H, Zerrouki.W, Daimellah.F : Cardiopathies et odontostomatologie. Problèmes de prophylaxie des endocardites infectieuses en fonction des valvulopathies. EMC-Medecine buccale.2012 ;7(3) :1-14.
4. Wilson. W, Kathryn. A, Taubert et al. Prevention of infective endocarditis : Guidlines from the American Heart Association.Circulation.2007;116:1736-1754.
5. Lesclous.P, Duffau.F, Bensahel.J et al. Agence Française de Sécurité Sanitaire et de Produits de santé (AFSSAPS). Recommandations de bonnes pratiques : Prescription des antibiotiques en pratique bucco-dentaire. Med Mal infect 2011 ;42 (5) :193-212.
6. Habib.G, Lancellotti.P, Antunes.M.J et al. 2015 ESC Guidlines for the management of infective endocarditis.The task force for the management of infective endocarditis of the European Society of Cardiology (ESC).Endorsed by:European Association for cardio-thoracic surgery (EACTS), the European Association of Nuclear Medicine (EANM). Eur Heart J 2015; 36:3075-3123.
7. Revest.M, Doco-Lecompt.T, Hoen.B et al. Association pour l'Etude et la Prévalence de l'Endocardite Infectieuse en France. Invs-bulletin épidémiologique hebdomadaire 2013;10 :89-94.
8. Correa De Sa.DD, Tleyjeh.I.M, Anavekar.NS et al. Epidemiological trends of infective endocarditis :a population –based study in Olmsted Country,Minnesota. Mayo Clin 2010;85(5):422-426.
9. Oliver.R, Roberts.GJ, Hooper.L et al. Antibiotics for the prophylaxis of bacterial endocarditis in dentistry.
10. Cochrane Database Syst Rev 2008 ;8(4) :CD003813.
11. Gopalakrishnan et al. Infective Endocarditis : Rationale for Revised Guidelines for Antibiotic Prophylaxis. Clinical Medicine and Research. 2009; 7(3): 63-68.
12. Allen.U. Infective endocarditis: updated guidelines. Paediatr Child Health 2010; 15(4): 205-8.
13. Cloitre A, Duval X, Hoen B, Alla F, Lesclous P. A nationwide survey of French dentists' knowledge and implementation of current guidelines for antibiotic prophylaxis of infective endocarditis in patients with predisposing cardiac conditions. Oral Surg Oral Med Oral Pathol Oral Radiol. 2018;125(4):295-303.
14. Santhosh Kumar.MP et Sneha.S. Knowledge and awareness regarding antibiotic prophylaxis for infective endocarditis among undergraduate dental students. Asian J Pharm Clin Res 2016, 9(2) :154-159
15. Afnan.F.Al, Rafif M.Al-S, Refal.S.Al-B et coll. Antibiotic prophylaxis against infective endocarditis in adult and child patients Knowledge among dentists in Saudi Arabia. Saudi Med J 2015; 36 (5): 554-561.
16. Cloitre A, Lesclous P, Trochu Q, Selton-Suty C, Boutoille D, Le Tourneau T, Delahaye F, Thomas D, Iung B, Gaudin A, Duval X, Trochu JN. Antibiotic prophylaxis of infective endocarditis in patients with predisposing cardiac conditions : French cardiologists' implementation of current guidelines. Int J Cardiol. 2020;299:222-227.
17. Bhayat.A, Jarab.F, Mansuri.S et al. Assessment of knowledge of Dental Staff at a Saoudi Arabien University regarding the Prophylaxis for infective endocarditis. Open Dent J 2013;7:82-87.