



ORIGINAL RESEARCH

KNOWLEDGE OF MOROCCAN DENTISTS TOWARDS THE PROPHYLAXIS OF INFECTIVE ENDOCARDITIS

Hajar BEN MOHIMD , Fatima ZAOUI, Bassima CHAMI, Wafae EL WADY
Orthodontic Department Faculty of Dentistry, Mohammed V University, Rabat, Morocco. 

ABSTRACT

Background: The involvement of oral bacteria in the occurrence of infective endocarditis (IE) has prompted the adoption of antibiotic prophylaxis prior to dental procedures for patients at high-risk. The aim of this paper was to assess the knowledge of Moroccan dentists regarding the management of patients with heart disease at risk of infective endocarditis.

Methods: This was a cross-sectional descriptive analytical study which targeted 200 dentists in the city of Rabat- Morocco. A questionnaire with 16 questions was distributed randomly. The level of knowledge of dentists was established based on the number of correct answers for each section and responses were assessed according to the American Heart Association (AHA) 2007 guidelines.

Results: Only 133 practitioners have agreed to participate in our study with a response rate of 66,5%. 87% of dentists reported contacting the cardiologist before starting treatment, 33% of practitioners weren't aware of any guidelines and 20% knew AHA 2007, 52% reported not following guidelines in the management of patients with heart disease. Among the cardiac conditions and dental procedures proposed in the questionnaire which required prophylaxis; 8% and 2% respectively chose the correct answer according to the AHA's 2007 guidelines. 31% of dentists answered correctly on the prescription of antibiotic prophylaxis protocol according to the latest recommendations.

Conclusion: According to our results, the knowledge of Moroccan private general dentists towards endocarditis prophylaxis was in a low level. The study highlights the need for continuous education.

KEY WORDS: Infective endocarditis, prophylactic antibiotics, knowledge, cardiac conditions, dental procedures.

Corresponding author:

Hajar Ben Mohim, Orthodontic Department Faculty of Dentistry, Mohammed V University, Rabat, Morocco.

Email : hjarbenmohim@gmail.com

Copyright © 2018 Ben Mohim et al.

This is an open access article distributed under the [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Endocarditis is defined as “an inflammation of the endocardial surface of the heart. This might include heart valves, mural endocardium, or the endocardium that covers implanted material” [1]. It's an uncommon but a severe infectious disease with a significant mortality and morbidity [2].

It results from a complex interaction between the bloodstream pathogen with matrix molecules and platelets at sites of endocardial cell damage during transient bacteremia [3].

Over the past few decades even if its incidence seems to have been stable, its epidemiological and microbiological profiles have considerably changed. Classically, IE reached young adults with a well identified pre-existing valvulopathy, mostly post-rheumatic [4]. Today, in

industrialized countries, IE affects elderly patients (more than 65 years old) and in half the cases, no known pre-existing heart disease [9]. Besides, some authors find a staphylococcal IE increase at the expense of streptococcal IE [5] [6].

In the absence of treatment, IE is fatal in 100% of cases [7]. A heavy medical treatment associated in nearly half the cases with cardiac surgery is the most common treatment of this disease [5][6] [8]. Overall, in-hospital mortality is around 20%.

In a attempt to prevent this disease, Guidelines have been developed by professional societies and antibiotic prophylaxis was given before health care procedures at risk for bacteremia in patients with previously diagnosed cardiac predispositions. In common practice, dental care

procedures are the most common situations for which antibiotic prophylaxis has been recommended.

However, modality and antibiotic indications have changed since the publication of the first AHA's recommendation in 1955 [9].

In fact after an ascending phase where antibiotic prophylaxis was systematic and its indications have gradually extended, downward phase started and antibiotic prophylaxis was only maintained for patients at high risk of IE whose prognosis in case of occurrence is unfavorable. So the current tendency is to limit prophylaxis to the procedures and populations with the highest risks [10].

Dentists are required to be conscious of and comprehend the modified guidelines and prescribe ABs appropriately in order to ensure proper care and avoid the consequences of abuse prescription.

Many studies [11][12] have reported an insufficient level of knowledge of the dentists in private practice as regards to the prophylactic guidelines for the prevention of IE. No similar studies have been done in Morocco.

The aim of this study was to assess Moroccan dentists' knowledge and adherence to the current guidelines for prevention of IE.

MATERIALS AND METHODS

This was a cross-sectional descriptive analytical study which targeted 200 Moroccan general dentists in the city of Rabat. All of the participants were chosen by census sampling methods.

All practitioners were given a self-administered questionnaire (after been pre-tested on 30 general dentists attending a national congress). The questionnaire consisted eight separate parts addressing:

- The characteristics of the surveyed practitioners: demographic information such as gender, age, years of experience, university
- Practitioners' knowledge and adherence to guidelines for prevention of IE
- Heart disease requiring the use of ABs prophylaxis: This section listed 9 cardiac conditions, for each one, practitioners had to select one of the three options: "Yes, I prescribe", "No, I do not prescribe" and "I don't know". The results were assessed according to AHA's 2007 guidelines.
- Dental procedures requiring ABs prophylaxis: this section included 8 common dental acts, practitioners were asked to select one of the former three options.
- AB prophylaxis regimen: the type of AB prescribed both in first intention and in case of allergic dosage and frequency of prescription
- Point of view of private dentists as regards to the validity of AB prophylactic in the prevention of IE.

The data's collection took place from February first, to March first, 2015. For each question dentists had to recognize all the correct proposals and responses were graded according to the AHA's 2007 guidelines. The data were analyzed using the Statistical Package for Social Services (SPSS) software package. Basic descriptive

statistics and comparisons were fulfilled with the following variables: gender, age, year of experience and place of graduation.

The comparison of qualitative variables was performed using the test "chi 2" and test "exact Fisher". The difference is considered statistically significant if the p value is less than 0.05

RESULTS

Only 133 out of 200 dentists agreed to participate in this survey with a percentage of overall participation of 66.5%. Of the 133 practitioners who participated in the survey; 54% of practitioners are male. the most represented age group is 25-35 (38%) and the sample was predominantly composed of dentists practicing in private practice (86%). 40% of practitioners have been practicing for more than 10 years and 64% of dentists graduated from a Moroccan University (Table 1).

More than two thirds of practitioners (87%) reported referring cardiac patients to their cardiologist before undertaking invasive dental procedures.

Table 1: The characteristics of the surveyed practitioners

Characteristics	N (%)
Gender:	
- Male	72 (54%)
- Female	61(46%)
Age:	
- 25-35 years	51 (38%)
- 35-45 years	46 (35%)
- 45-55 years	31 (23%)
- > 55 years	5 (4%)
Number of years of exercise:	
- ≤3 years	34 (26%)
-]3-10] years	45 (34%)
- >10 years	54 (40%)
Place of graduation:	
- Moroccan university	89 (67%)
- Foreign university	44 (33%)
Nature of dental practice:	
- Individual	114 (86%)
- Dental group	15 (11%)
- Clinic	4 (3%)

The General knowledge of guidelines for prevention of IE:

Approximatively, 54% of the dentists reported been familiar with at least one of the queried guidelines. 20% were familiar with the AHA. However, 32% of the dentists haven't recognized any guidelines among the proposals (AHA 2007, NICE 2008, AFSSAPS 2011 or others) (Figure 1).

Concerning the guidelines applied by dentists in their private practice, only 10% reported adopting AHA's 2007 recommendations in the management of patients at high risk of IE while 52% weren't following any guidelines (Figure 2).

Cardiac conditions for prescribing prophylactic antibiotic:

The decision of prescribing ABs or not, for certain cardiac conditions to prevent the occurrence of IE is shown in Table 2. Only 8% of practitioners have recognized all the

heart diseases with risk of IE requiring the use of prophylactic ABcs. Indeed, some heart diseases associated with a highest risk of complications in case of IE (Prosthetic cardiac valve, history of IE, Unrepaired cyanotic congenital heart disease) were properly evaluated by a large majority of practitioners. Others such as the pacemaker, ischemic heart disease, Rheumatic heart disease and cardiac transplantation) did divide practitioners' opinion.

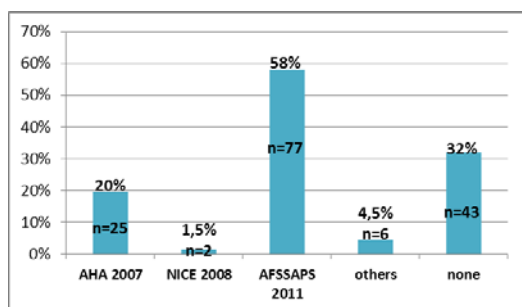


Figure 1: Knowledge regarding the guidelines for prevention of infective endocarditis

However, valvular heart diseases were incorrectly evaluated by the majority of respondents (77%) as being misidentified at high risk of IE.

The data analysis also showed that while gender and place of graduation did not have any effect on knowledge (table 3 and 4), there was a higher rate of correct response among practitioners from the age range (25-35 years) and those recently installed (≤ 3 years) with a statistically significant difference ($p < 0.05$) (table 5 and 6).

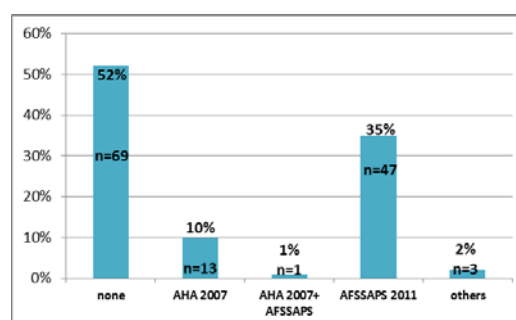


Figure 2: Guidelines applied in daily practice

Table 2: Responses Obtained Regarding the Prescription of Antibiotics for the Common Cardiac Conditions

Types of cardiac condition	Responses in %		
	Yes	NO	I don't know
Prosthetic cardiac valve	96%	1,5%	2,5%
Previous infective endocarditis	92%	6%	2%
Unrepaired cyanotic congenital heart disease	85%	13%	2%
Congenital heart defect completely repaired (6months after the procedure)	68%	29%	3%
Valvular heart disease	77%	20%	3%
Rheumatic heart disease	52%	45%	3%
Ischemic heart disease	40%	58%	2%
Cardiac transplantation	74%	23%	3%
Pacemaker	53%	44%	3%

Table 3: Gender impact on the knowledge of Moroccan dentists concerning the management of patients at risk of IE

Level of knowledge	Male n (%)	Female n (%)	p
Cardiac conditions at risk	4 (7%)	6 (10%)	0,5
Dental procedures requiring antibiotic prophylaxis	1 (1,4%)	2 (3,3%)	0,5
Regimens	21 (29,2%)	20 (32,8%)	0,6

Table 4: Impact of the place of graduation on the knowledge of Moroccan dentists concerning the management of patients at risk of IE

Level of knowledge	Moroccan University n (%)	Foreign University n (%)	p
Cardiac conditions at risk	2 (2,2)	2 (4,5)	0,29
Dental procedures requiring antibiotic prophylaxis	2 (2,3)	1 (2,3)	1
Regimens	31 (34,8)	10 (22,7)	0,1

Table 5: Influence of age on the knowledge level of Moroccan dentists concerning the management of patients at risk of IE

Level of knowledge	25-35ans	35-45ans	45-55ans	>55ans	p
Cardiac conditions	8 (15,7%)	1 (2,2%)	1 (3,2%)	0 (0%)	0,04*
Dental procedures at risk	3 (5,9%)	0 (0%)	0 (0%)	0 (0%)	0,18
Regimens	11 (26,8%)	18 (43,9%)	10 (24,4%)	2 (4,9%)	0,28

Table 6: Impact of number of years of experience on the level of knowledge of Moroccan dentists concerning the management of patients at risk of IE

Level of knowledge	≤ 3 years	[3-10] years	> 10 years	p
Cardiac conditions	8 (23,5%)	1 (2,2%)	1 (1,9%)	0,001*
Dental procedures at risk	2 (6%)	1 (2,2%)	0 (0%)	0,1
Regimens	8 (23,5%)	12 (26,7%)	21 (38,9%)	0,2

Dental procedures for prescribing prophylactic antibiotics:

Respondents had to choose from the 8 dental procedures proposed those which require the prescription of AB prophylaxis to prevent IE, only 2% of practitioners answered correctly according to the AHA's

recommendations. These results are mainly due to an improper prescription of antibiotic prophylaxis during noninvasive acts. In fact, 56% of practitioners prescribe unnecessary AB prophylaxis before routine anesthetic injections and 27% during occlusal restorations (Table 7).

Table 7: Responses Obtained Regarding the Prescription of Antibiotics for the Common dental procedures

Types of dental procedures	Responses in %		
	Yes	NO	I don't know
Dental avulsion	98%	2%	0%
Scalling	77%	22%	1%
Root planning	96%	2%	2%
Conservative procedure: occlusal restoration	27%	71%	2%
Conservative procedure: proximal restoration	62%	36%	2%
Postoperative removal of sutures	35%	64%	1%
Placement of retraction wire	69%	29%	2%
Routine anesthetic injections	56%	42%	2%

Regimens :

Concerning prophylactic treatment; 91% of physicians chose the correct antibiotic's agent (amoxicillin), 53% the correct dosage (2g) and 55% the correct timing (period of administration: single dose 1 hour prior the act). However, only 31% of practitioners apply the correct protocol in accordance with the three parameters. Table 8 lists prescription protocol of antibiotics by the practitioners who responded to the present survey (Table 8).

In case of allergy to amoxicillin, the recommended antibiotic is azitromycin or clindamycin; 56% answered correctly. However 3% of dentists noted to refer all cases to the cardiologist for the antibiotics prescription. 66% of responders felt that AB prophylaxis should be routine in all heart diseases patients to prevent the occurrence of infective endocarditis.

Table 8: Responses Obtained Regarding regimens for dental procedures

Regimens	Responses
Agent:	
Amoxicillin	91%
Amoxicillin + clavulanic acid	5%
others	4%
Dosage:	
2g	53%
3g	36%
4g	1%
1g	1%
2-3g	3%
50mg/Kg	1%
Timing:	
Single dose 1 hour before the procedure	55%
Before and after the procedure	43%
Others	2%
Correct regimens (Agent+dosage+ timing)	31%

DISCUSSION

The management of patients at high risk of IE in dental practice requires the knowledge of IE prevention measures. This prevention is obtained through maintaining

optimal oral hygiene, the rehabilitation of the oral cavity to reduce spontaneous bacteremia and by the prescription of antibiotic prophylaxis before any bloody act likely to cause transient bacteremia.

The efficacy of AB prophylaxis in the prevention of IE after dental procedures is one of many topics that has long been debated and continue to confuse practitioners [13]. Consequently, different prophylactic treatments are used among various countries across the world [14].

These differences increase the confusion of dentists and therefore, many practitioners prescribe antibiotic prophylactic unnecessarily or incorrectly [15][16].

Since IE is a severe infectious disease with a significant mortality and morbidity and dental acts have been incriminated in its occurrence, it is important for general dentists to know the latest recommendations in order to ensure an optimal management.

The results of this study showed a very low level of knowledge of Moroccan dentists concerning the prevention of IE. 20% of practitioners have recognized AHA's guidelines but only 10% reported adopting its recommendations. In fact, 52% of dentists reported not adopting any guidelines recommendations in the management of patients at high risk of IE. This figure includes the 33% of practitioners who haven't recognized any scientific societies but also 19% of those reporting recognizing at least one. This result coincides with the one of Nakano et al. [16] where only less than 20% of Japanese practitioners follow the recommendations of the AHA 2007. However, Bhayat A. et al. [17] found in the Kingdom of Saudi Arabia, that 97% of dentists are based on AHA's 2007 recommendations for prevention of IE.

The level of knowledge of practitioners regarding cardiac conditions requiring endocarditis prophylactic (8%) was very mild compared to the results reported by other studies. In 2007, A. Eskandari and al. [18] reported in Tabriz a percentage of 63.7% of correct responses. In 2013, Bhayat and al [17] found a level of knowledge of 47% in Saudi Arabia's kingdom. In response to the different heart conditions, there were a

statistically significant difference in the responses when correlated against the age and years of experience and whether to prescribe or not ($p < 0.05$). There was a higher rate of correct response among practitioners from 25-35 years age range and recently installed practitioners (≤ 3 years). This was in line with the results reported by A. Eskandari and al in 2008 [11], who found that the age factor and the number of years of exercise influence the level of knowledge of practitioners. However, Bhayat and al [17] found in 2013 no significant differences between these variables. The insufficient level of knowledge of practitioners regarding the determination of heart disease at high risk of IE can be explained on one hand by the high percentage of dentists who included valvular heart disease in the category of high-risk patients requiring the use of prophylactic ABs, on the other hand, the current trend of practitioners to the over-prescription of antibiotics that can be justified by an exaggerated panic against managing the risk of infection for fear of occurrence of IE. Indeed, dentists no longer bother to update their knowledge and prefer either to refer their patient to the cardiologist or to systematically prescribe AB prophylaxis. In fact, 66% of practitioners think that AB prophylaxis should be systematic in all patients with heart diseases.

We must not forget that a significant number of patients who underwent earlier antibiotic prophylaxis for several years required having a prescription of prophylactic antibiotics before any dental act.

The level of knowledge of Moroccan dentists regarding dental acts requiring AB prophylaxis was only 2%. Which is lower than the results obtained in 2007 by Eskandari [18] and al (66.8%) and Bayat and al in 2013 (83%) [17]. This insufficient level of knowledge found in our survey is mostly related to the fact that many dentists were overprescribing for situations that didn't need ABs. This could be due to the regular change in the recommendations over the past years and the statements imprecision concerning the acts requiring the use of antibiotic prophylaxis. Another possible reason could be that Moroccan dentists were doubtful and decided to err on the side of caution and rather overprescribe.

The level of knowledge of the latest recommended prophylaxis regimen was 31%. Indeed almost everyone reported to prescribe the drug of choice Amoxicillin (91%) but 36% of dentists reported prescribing a dose of 3g instead of 2g and 43% to administer multiple doses before and after the act. This can be related to the variability between earlier and latest version of the guidelines (ex: previous guidelines recommended 3g whilst the updated guidelines recommend 2g). Some practitioners (2%) reported leaving the choice of the entire AB prophylaxis protocol to the physician, may be in order to deny any responsibility and to avoid compromising the prognosis. Although antibiotic agent was recognized by the majority of practitioners, however the dose and administration period are major mismatch points. This was similar to results reported by Chitsazi [19], Eskandari [18], Boyle [20] and Cloitre [21] where the prescription protocol still not in conformity with what is currently recommended.

Regarding the antibiotic Agent selected in second line (in case of allergic to Amoxicillin) several proposals were discussed, however, 56% correctly answered either by Azithromycin or Clindamycin. It is likely that the dentists are unaware of the adverse effects of inadequate prescription of infectious agents and the risk of occurrence of fatal allergic reactions in these circumstances of prescription. The majority of practitioners for fear of occurrence of IE, prescribe high dose of antibiotics for a long period, or, such a requirement is not without consequences and can cause medical, environmental and economic risks.

Based on the results presented, our study highlighted on one hand a lack of knowledge of the practitioners about the currently recommended management of patients at risk of IE, whether for the assessment of the risk of IE or its prevention and in the other hand there was a lack of practitioner's adherence to the current guidelines. The lack of knowledge found in our study can be interpreted by the lack of dissemination of the recommendations.

The lack of practitioners adherence to the current guidelines may be to seek either in; the controversy surrounding the efficiency of AB prophylaxis and the low level of scientific proof of the recommendations which are based on expert opinion and are far from unanimous, or ignorance of the vast majority of practitioners on the existence of spontaneous bacteremia, a cornerstone of justification for reducing the scope of AB prophylaxis.

Moreover, it is very likely that the inappropriate prescription of AB prophylaxis in respect of a non-significantly predisposing heart disease is maintained by a lot of fear of the occurrence of IE.

According to these results, more attention should be given to prophylactic prescription protocol and identification of patients and dental procedures at-risk. Knowledge and adoption of AHA's latest recommendations will enable dentists to properly prescribe antibiotics, thus reducing both the risk of occurrence of IE and bacterial resistance or shock anaphylactic related to the over-prescription.

The results of this study, however, are taken with caution given certain limitations:

- The low participation rate of dentists
- The high percentage of practitioners with over 10 years of experience
- This is a declarative study. A gap may exist between declared practices and actual practices. However it is unlikely that practitioners who don't know the recommendations are appropriate prescription

Despite these limitations, this study provides new and important information on the knowledge of dentists practicing in the city of Rabat about the management of patients with heart diseases and their adherence to targeted AB prophylaxis current recommendations of the IE.

Recommendations: According to these results, Training programs should be introduced in order to improve the level of knowledge of general private practitioners regarding dental considerations of medically-compromised patients.

CONCLUSION

This study has revealed a very low level of knowledge of the Moroccan private practitioners about the currently recommended management of patients at risk of IE.

The results indicated that there is a statistically significant relationship only between age, years of experience and the level of knowledge of cardiac conditions requiring endocarditis prophylactic.

LIST OF ABBREVIATIONS

IE: infective endocarditis

AHA: American Heart Association

ABs: Antibiotics

REFERENCES

- [1] Franck Thuny, MD, PhD and al. Infective Endocarditis: Prevention, Diagnosis, and Management. *Canadian Journal of Cardiology* 30 (2014) 1046-1057
- [2] Prendergast B D. The changing face of infective endocarditis. *Heart* 2006; 92: 879-885
- [3] Wilson. W, Kathryn. A, Taubert and al. Prevention of Infective Endocarditis: Guidelines From the American Heart Association. *Circulation*. 2007;116:1736-1754
- [4] European Society of Cardiology. The task force on the prevention, diagnosis and treatment of infective endocarditis of the European society of cardiology. Guidelines on the prevention, diagnosis and treatment of infective endocarditis. *Eur Heart J* 2009;30:2369-2413.
- [5] Duval X, Delahaye F, Alla F, Tattevin P, Obadia JF, Le Moing V, and al. Temporal trends in infective endocarditis in the context of prophylaxis guideline modifications: three successive population- based surveys. *J Am Coll Cardiol* 2012;59:1968-1976.
- [6] Moreillon P, Que YA. Infective endocarditis. *Lancet* 2004; 363:139-149.
- [7] Duval X, Lepout C. Prophylaxis of infective endocarditis: current tendencies, continuing controversies. *Lancet Infect Dis* 2008;8:225-232
- [8] Bannay A, Hoen B, Duval X, Obadia JF, Selton-Suty C, Le Moing V, and al. The impact of valve surgery on short- and long-term mortality in left-sided infective endocarditis: do differences in methodological approaches explain previous conflicting results? *Eur Heart J* 2011;32:2003-2015
- [9] Committee on prevention of rheumatic fever and bacterial endocarditis, American Heart Association. Prevention of rheumatic fever and bacterial endocarditis through control of streptococcal infections. *Circulation* 1955;11:317-320
- [10] François Delahaye, Brahim Harbaoui, Virginie Cart-Regal, Guy de Gevigney. Recommendations on prophylaxis for infective endocarditis: Dramatic changes over the past seven years. *Archives of Cardiovascular Disease* (2009) 102, 233—245
- [11] Coutinho AC, Castro GF, Maia LC. Knowledge and practices of dentists in preventing infective endocarditis in children. *Spec Care Dentist* 2009; 29(4): 175-8.
- [12] Zadik Y, Findler M, Livne S, Levin L, Elad S. Dentists' knowledge and implementation of the 2007 American Heart Association guidelines for prevention of infective endocarditis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008; 106(6): e16-9.
- [13] Oliver R, Roberts GJ, Hooper L, Worthington HV. Antibiotics for the prophylaxis of bacterial endocarditis in dentistry. *Cochrane Database Syst Rev* 2008; 8(4): CD003813.
- [14] Gopalakrishnan PP, Shukla SK, Tak T. Infective endocarditis: rationale for revised guidelines for antibiotic prophylaxis. *Clin Med Res* 2009; 7(3): 63-8
- [15] Chate RA. An infective endocarditis audit illustrates why dental guidelines in general need to be kept clear, simple and unambiguous. *Br Dent J* 2008; 205(6): 331-5.
- [16] Nakano K, Ooshima T. Common knowledge regarding prevention of infective endocarditis among general dentists in Japan. *J Cardiol* 2011; 57(1): 123-30.
- [17] Bhayat A, Jarab. F, Mansuri. S and al. Assessment of Knowledge of Dental Staff at a Saudi Arabian University Regarding the Prophylaxis for Infective Endocarditis. *The Open Dentistry Journal*, 2013, 7, 82-87
- [18] Eskandari. A, Abolfazli. N, Lafzi. A. Endocarditis Prophylaxis in Cardiac Patients: Knowledge among General Dental Practitioners in Tabriz. *JODDD* 2008;2(1):19-15
- [19] Chitsazi. MT, Pourabbas. R. Knowledge of dentists who practice in Tabriz regarding the latest prophylaxis regimens for prevention of infective endocarditis. *Medical Journal of Tabriz University of Medical Sciences* 2005; 64:40-44
- [20] Boyle. N, Callagher. C, Sleaman. D. Antibiotic prophylaxis for bacterial endocarditis: a study of knowledge and application of guidelines among dentists and cardiologists. *J Ir Dent Assoc* 2006; 51:232-7. (3)
- [21] Cloitre. A, Duval. X, Lesclous. P. Antibiotic prophylaxis of infective endocarditis, compliance with recommendations of good practice, national survey of dental surgeons. *Med Buccale Chir Buccale* 2014 ; 20 :141-153

AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals](#) of the [International Committee of Medical Journal Editors](#). Indeed, all the authors have actively participated in the redaction, the revision of the manuscript and provided approval for this final revised version.

SPONSORSHIP

Declared none.

COMPETING INTERESTS

The authors declare no competing interests.