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## Prevention of infective endocarditis during dental extractions among Polish dentists — a contemporary nationwide survey

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**Abstract:** **Introduction:** Infective endocarditis (IE) is a potentially life-threatening condition. According to current ESC (European Society of Cardiology) guidelines, the use of antibiotic prophylaxis should only be reserved for specific dental procedures with interruption of consistency of the oral mucosa such as extractions and should be reserved for patients with the highest risk of developing IE. The aim of this study was to assess the knowledge of need for IE prophylaxis in defined clinical settings among Polish dentists.

**Material and Methods:** A specially self-designed internet questionnaire was created concerning the topic of infective endocarditis prophylaxis in specific clinical scenarios for patients undergoing dental extractions during outpatient visits. The survey was made available to the dentists via internet and was active in March 2018.

**Results:** There were 352 Polish dentists who completed the survey. Antibiotic prophylaxis for IE during dental extractions was used in 93% of cases with prior IE, 89% with artificial heart valve, 69% with biological valve, 28% with pacemaker, 54% with coronary stent, 73% with cyanotic heart defect, 58% with diabetes mellitus, 20% after prior myocardial infarction and 54% with heart valve disease. There was a significant relationship between the time of working as a physician (>15 years) and more outdated or improper IE prophylaxis ( $p = 0.04$ ).

**Conclusion:** The management of patients for infective endocarditis prophylaxis undergoing dental extractions is suboptimal. Antibiotic therapy is overused in some clinical scenarios and on the other hand underutilized in those recommended by the current ESC guidelines.

**Key words:** infective endocarditis, prevention, dentists.

## Introduction

Infective endocarditis (IE) is a potentially life-threatening condition caused by streptococci infection which may also be caused by residual bacteria of the human oral cavity [1, 2]. Appropriate prevention of IE reduces severe complications and mortality rates [3–6]. However, the balance between risks and benefits of antibiotic treatment should always be carefully evaluated in individual patients [7]. Experts emphasise dominant impact of remittent bacteriemia caused by daily hygienic procedures of oral cavity such as toothbrushing, rather than the influence of invasive medical procedures [8–13]. This and the lack of strong evidence showing robust benefit from IE prophylaxis succeeded in recommendation that wise and preferably preservative administration of antibiotics should be performed [13–16].

According to current ESC (European Society of Cardiology) guidelines, the use of antibiotic prophylaxis should only be reserved for specific dental procedures with interruption of consistency of the oral mucosa such as extractions and should be reserved for patients with the highest risk of developing IE. These patients include: those with previous IE, cyanotic CHD (congenital heart disease) and prosthetic valves or any other foreign material used for native valve repair or to correct CHD [17–20]. Growing number of patients with prosthetic valve replacement surgery every year including novel TAVI procedures certainly widens the population at risk of IE and need for prophylaxis [21].

The aim of this study was to assess the knowledge of need for IE prophylaxis in defined clinical settings among Polish dentists.

## Material and Methods

A specially self-designed internet questionnaire was created concerning the topic of infective endocarditis prophylaxis in specific clinical scenarios for patients undergoing dental extractions during outpatient visits. It consisted of 12 questions. The initial

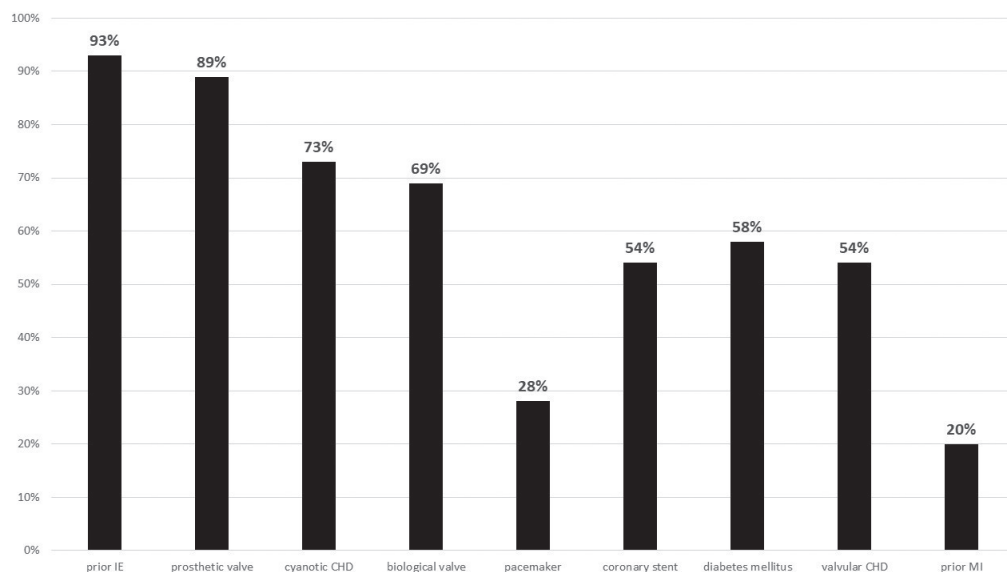
3 questions were related to general information: years of dental practice, board certification and performing dental extractions. Board certification was defined as having any formal specialist title in at least one of 7 fields (dental surgery, maxillofacial surgery, orthodontics, periodontology, prosthetics, children's dentistry, dentistry with endodontics). Another 9 questions asked about IE prophylaxis in different clinical settings (presence of prosthetic valve, prior IE, cyanotic CHD or corrected CHD up to 6 months from procedure, valvular disease, presence of biological valve, coronary stent, prior MI, diabetes mellitus, pacemaker). Questions wording and accuracy was consulted independently by both a specialist cardiologist and a specialist dentist. The survey was made available to the dentists via internet. Invitation was sent to potential participants in cooperation with and through the database of the members of the Polish Dental Association (Polskie Towarzystwo Stomatologiczne, PTS). The survey was active throughout March 2018. The study was voluntary and anonymous. Participants acknowledged consent for scientific data use, thus the study did not require Ethics Committee approval.

### Statistical analysis

Standard descriptive statistics were used in this manuscript. Categorical variables were presented as counts and percentages. The chi-squared test was used to evaluate the correlation of qualitative data. A p value <0.05 was considered as statistically significant. All analyses were performed with Statistica 12 commercial software (StatSoft, Inc. Tulsa, OK, USA).

### Results

There were 352 Polish dentists who completed the survey and 310 among them perform dental extractions as part of their dental practice (88%). Majority (80%) of them had practiced dentistry for over 5 years and 44% of them was board certified in any dental specialization. The prevalence of antibiotic prophylaxis for IE both in guideline-recommended clinical settings as well as some historical ones or contraindicated clinical scenarios are presented in Figure 1. Additional analysis of the percentage of IE prophylaxis in dental patients undergoing dental extractions in the clinical settings described above with relation to the number of years of medical practice as well as presence of board certification is presented in Tables 1 and 2 respectively.



**Fig. 1.** IE prevention according to cardiovascular disease.

**Table 1.** IE prophylaxis based on the years of experience in dental practice.

	Up to 5 years n = 62	5–15 years n = 96	Over 15 years n = 152	p	p 1 vs 2	p 1 vs 3	p 2 vs 3
Prior IE	95%	94%	92%	0.701	0.903	0.665	0.605
Prosthetic valve	94%	94%	85%	0.043*	0.899	0.040*	0.029*
Cyanotic CHD	82%	80%	65%	0.007*	0.711	0.001*	0.022*
Biological valve	57%	66%	77%	0.008*	0.031*	0.001*	0.045*
Pacemaker	23%	27%	32%	0.393	0.445	0.333	0.292
Coronary stent	47%	56%	56%	0.423	0.356	0.301	0.899
Diabetes mellitus	44%	64%	61%	0.031*	0.002*	0.041*	0.677
Valvular CHD	63%	51%	52%	0.277	0.196	0.255	0.850
Prior MI	19%	25%	17%	0.256	0.345	0.675	0.199

\* p < 0.05

**Table 2.** IE prophylaxis based on board certification.

	Yes n = 136	No n = 174	p =
Prior IE	92%	94%	0.416
Prosthetic valve	88%	91%	0.349
Cyanotic CHD	70%	76%	0.236
Biological valve	70%	69%	0.866
Pacemaker	29%	28%	0.920
Coronary stent	53%	55%	0.696
Diabetes mellitus	65%	52%	0.019*
Valvular CHD	56%	52%	0.529
Prior MI	19%	20%	0.827

\* p &lt;0.05

## Discussion

This is best to our knowledge the first nationwide and contemporary attempt to evaluate IE prophylaxis for dental extractions and the adherence to current ESC guidelines among Polish dentists. In our study, we have noticed that ca. 90% of dentists are providing antibiotic pretreatment in high risk IE patients (prior IE, prosthetic valve) while only 73% is adhering to guidelines in patients with cyanotic CHD. It is also worth mentioning that artificial biological valve is still considered as a strong indication for prophylaxis among our study group (69%). Our results are similar to the study by Spittle *et al.* [22], because their survey showed that 95% of dental practitioners used prophylaxis in patients with history of endocarditis but only 76% in patients with prosthetic valve. On the other hand, a study by Tomczak *et al.* has revealed a very poor adherence to guidelines when it comes to prior IE with only 75% prescribing prophylaxis and 70% with a prosthetic valve [23]. Over 50% of patients with such risk factors and comorbidities like DM, coronary stents and valvular CHD are still treated with antibiotics for dental extractions in Poland according to our study. The abovementioned results are probably based on the dentists experience and general knowledge but certainly not current recommendations. This is especially true for DM patients who are significantly more often treated with antibiotics by dentists practicing 15 years and more. The newest guidelines are moderately recent (2015) and have changed the approach to IE prophylaxis which could also be the reason for our results.

We have shown that there is a statistical significance between years of clinical experience as a dental professional and underutilization of IE prophylaxis in high risk patients. More experienced dentists (over 15 years of practice) prescribe antibiotics significantly less frequently in cases of prosthetic valve and cyanotic CHD, which could be caused by outdated knowledge. It is interesting that dentists with minor experience (<5 years) provide better guideline-recommended adherence to IE prophylaxis. Interestingly, these practitioners seldom uses prophylaxis in other diseases such as DM. It seems that younger dentists who have had their final exams and entrance exams for specialist training have better current knowledge than their older colleagues who might not train or attend updated seminars in this field. The overuse of prophylaxis with antibiotics in patients after MI or with coronary stent is worrisome since there are over 100 000 such patients each year in Poland alone [21]. This unprecedented off-label use of antibiotics might cause individual complications as well as bacterial resistance. According to Cloitre *et al.* [24] only 34.5% from 12 000 French responders had overall knowledge about current IE guidelines. Spanish data reveal that antibiotics are overutilized in IE prevention setting that does not require prophylaxis [25]. We have also shown that board certification itself does not seem to influence better adherence to guidelines in terms of IE prophylaxis.

Guidelines have gone through major changes and are updated every several years. It seems that the knowledge among Polish dentists and their use of IE prophylaxis in clinical everyday practice is suboptimal and requires constant medical education so as to follow current evidence based medicine.

### Limitations

The main limitation is a small study sample. We also did not ask specific questions concerning the details of the prophylaxis eg. names and doses of antibiotics and types of dental procedures that would require such, however, the main aim was to assess the adherence to current clinical indications for IE prophylaxis rather than enhance the questionnaire which could jeopardize the number of dentists who would fill it in. The internet survey certainly does not represent the entire dentist population in Poland (response rate ca. 10%).

### Conclusions

The management of patients for infective endocarditis prophylaxis undergoing dental extractions is suboptimal. Antibiotic therapy is overused in some clinical scenarios and on the other hand underutilized in those recommended by the current ESC guidelines. This observation is especially true in dentists with over 15 years of dental

practice experience. More educational efforts among dentists in Poland needs to be undertaken to change this pattern.

### Acknowledgments, funding and disclosures

None.

### Conflict of interest

None declared.

### Abbreviations

- CHD — congenital heart disease  
DM — Diabetes Mellitus  
ESC — European Society of Cardiology  
IE — infective endocarditis  
TAVI — transcatheter aortic valve implantation

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