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Assessment of endocarditis prophylaxis knowledge and attitudes among healthcare practitioners in Tehran and Hamadan

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Abstract

Background Having knowledge of the dental procedures that necessitate endocarditis prophylaxis is of high importance. Therefore, the aim of the present study was to determine the knowledge level and attitudes of general medical and dental practitioners, dental specialists, and cardiologists in Tehran and Hamadan about endocarditis.

Methods This cross-sectional study was carried out on 420 general medical and dental practitioners, dental specialists, and cardiologists in Tehran and Hamadan provinces in 2015. The questionnaire used in this research consisted of three parts as follows: part one: information on cardiac diseases; part two: dental procedures requiring endocarditis prophylaxis; part three: antibiotic diet in endocarditis prophylaxis. Independent t-test, one-way ANOVA, and chi-square tests were conducted to analyze the data. All the analyses were performed in SPSS version 16.

Results The results showed that 86.7 had a relatively favorable and 10.5% of subjects had a favorable level of knowledge about endocarditis. Also, 58.6% of subjects had a poor attitude toward endocarditis prophylaxis. There was a significant relationship between knowledge and attitude, age, gender, and work experience ($P < 0.001$). There was a significant relationship between knowledge and attitude, and job groups; dental specialists had a more favorable knowledge and positive attitude than others ($P < 0.001$).

Conclusion We recommended developing more practical training programs in dental schools on cardiac diseases, and dental procedures requiring endocarditis prophylaxis and antibiotic diets.

Keywords Knowledge, Attitude, Endocarditis, Prophylaxis, Health care workers

Introduction

Infective endocarditis (IE) is a serious and potentially life-threatening condition that has become less common in recent decades. However, it remains an important disease that requires ongoing awareness and preventive measures [1, 2]. Previous reports showed incidence of IE to be around 1.5 to 6 patients per 100,000 persons per year in adults [3]. Lazare Riviere described IE for the first time in 1646 and the disease was diagnosed as a curable disease in the 1960s. However, this disease is difficult to treat and has a poor diagnosis [4, 5]. IE results from bacteremia and commonly involves mitral and following aortic

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valves but it rarely affects pulmonary valve [6]. This disease is caused by various microbial gents such as bacteria and fungi in the heart endocardia layer which has already been damaged due to congenital and acquired disorders [7, 8]. In the oral mucosa, compared to normal flora, more than 300 species of bacteria exists [9]. Damage to oral mucosa, especially the gums around the teeth, which may happen during diagnostic or therapeutic procedures, may lead to temporary release of bacteria into the bloodstream and cause temporary bacteremia [10, 11]. Use of antibiotic prophylaxis before dental procedures has been a controversial issue for years. The American Heart Association (AHA) has published guidelines on antibiotic prophylaxis prior to dental procedures to prevent IE since 1955. These guidelines have been updated 9 times until its last update published in 2007 for resolving the controversy in the field [12]. Insufficient knowledge and weak to moderate performance of healthcare providers about AHA's previous guidelines have been reported [13–22].

Both cardiologists and general practitioners play critical roles in patient care, therefore understanding and following endocarditis prophylaxis guidelines is imperative [23]. General practitioners are frequently the first to interact with patients, recognize those who are at risk, and make sure the right prophylaxis is administered [24]. Cardiologists oversee the administration of prophylaxis during procedures and manage patients with heart problems that make them more susceptible to IE [25].

In order to ensure that at-risk patients receive the appropriate antibiotic prophylaxis, it is important to assess the knowledge and attitudes of these healthcare providers in order to detect any gaps in communication and collaboration [26]. Regular assessments identify areas for more education and training, resulting in more targeted treatments and better patient care for people at risk of IE. In addition to avoiding prescription antibiotics when it is not necessary, they should collaborate closely with dental experts to guarantee that patients at risk of IE get appropriate antibiotic prophylaxis prior to dental treatments [27].

Therefore, the aim of present investigation was to evaluate knowledge of general medical practitioners, general dental practitioners, dental specialists and cardiologists about the 2007 AHA guidelines and their attitudes toward them.

Methods and materials

This descriptive and cross-sectional study evaluated the knowledge and attitude of general medical practitioners, general dental practitioners, dental specialists and cardiologists toward antibiotic- prophylaxis in cardiac patients undergoing dental treatment in Tehran and Hamadan in 2015. Tehran was chosen in part because, being Iran's capital, it serves as a major hub for medical professionals and services. Hamadan was chosen as the other location for our study in order to a number of strong factors. First of all, the Hamadan University of Medical Sciences, renowned for its comprehensive medical education programs and enthusiastic participation in public health research, is located in Hamadan. This makes the city a valuable source of trained healthcare practitioners who can provide insightful data on endocarditis prophylaxis. Second, the healthcare system in Hamadan consists of a wide variety of medical establishments, ranging from remarkable hospitals to more intimate clinics, enabling a thorough evaluation of various occupational groups in the field of healthcare. This diversity guarantees that a broad range of professional experiences and endocarditis prophylactic methods are captured in the study. Thirdly, Hamadan provides a representative sample of healthcare professionals operating in both urban and semi-urban environments due to its geographic location and demographic structure. This is crucial to comprehending the disparities in attitudes and knowledge regarding endocarditis prophylaxis among various healthcare settings within a single area. Being one of the older cities with a lengthy history of medical practices, Hamadan also has historical significance in Iran's medical history. This historical background offers a distinctive background against which to analyze attitudes and actions in current medical practice. Finally, the choice of Hamadan was impacted by the availability and willingness of regional medical professionals and institutions to take part in the research, guaranteeing excellent data gathering and collaboration all the way through the study. By selecting Hamadan, the study plans to take use of the city's exceptional blend of historical significance, diverse healthcare, and top-notch education to provide a comprehensive evaluation of healthcare practitioners' attitudes and knowledge regarding endocarditis prevention.

We used the formula of

$$n = \frac{Z^2_{1-\frac{\alpha}{2}}(p)\ (1-p)}{(rp)^2}$$

with a type 1 error of 5%, p=0.8 ,and r=0.07 which was based on the data presented in the paper by Qadri et al. for calculating the sample size [28]. A total of 420 participants took part in this investigation: 140 general medical practitioners, 140 general dental practitioners, 70 dental specialists and 70 cardiologists. The participants were selected from among the medical specialists in 12 hospitals and 6 clinics in Tehran and Hamadan. Simple random sampling was employed as the sampling method. Inclusion Criteria consist (1) Cardiologists, general practitioners, and general and specialty dentists. (2) Practitioners who provide medical services to patients

with infective endocarditis. (3) Practitioners based in Tehran or Hamadan. Exclusion Criteria include Individuals who chose not to participate in the study. All participants were identified and recruited through professional networks, the Medical Council of Tehran and Hamadan, direct contact within the selected hospitals, clinics, private offices, professional associations, and scientific conferences. Hospitals and clinics were selected based on their reputation, accessibility, and comprehensive medical and dental services. Both public and private institutions were included to ensure a diverse sample. All the participants were informed about the investigation and asked to sign a written consent. Those who did not consent were then excluded from the sample. The questionnaire was designed for this study and given to participants (Appendix A). The questionnaire consisted of three parts: 'demographic characteristics', 'knowledge' and 'attitude'. In this questionnaire, we included questions from other studies [22] and added some more items about references for dental procedures. Validity of questionnaire was approved by 10 dental specialists in various fields. Both face validity and content validity were determined. Content validity ratio (CVR) and content validity index (CVI) were calculated to adjust questions based on expert feedback and ensure the questionnaire met established standards (CVR=0.8 and CVI=0.9). The questionnaire was first piloted by 30 participants to evaluate the reliability of the items before conducting the investigation. Cronbach's alpha coefficients for the internal consistency of knowledge and attitude of the questions were estimated to be 0.75 and 0.81 respectively. The attitude part of questionnaire toward antibiotic prophylaxis in cardiac patients undergoing dental treatment was consisted of 7 specific questions with an ordinal scale of 1 to 3. 1 for disagreement (indicating that the healthcare professional disagrees with the statement regarding IE or antibiotic prophylaxis), 2 for neutrality (indicating that the healthcare professional is unsure or neutral toward the statement), and 3 (indicating that the healthcare professional agrees with the statement regarding IE or antibiotic prophylaxis) for agreement. The "correct" answer varied for each question. The classification of attitudes was based on the number of questions answered correctly according to these pre-determined correct answers. a higher score reflected a positive attitude toward antibiotic prophylaxis. Zero to three correct answers was considered as poor, 4–5 correct answers was average, and 6–7 correct answers was good. The knowledge part of questionnaire about antibiotic prophylaxis in cardiac patients undergoing dental treatment was consisted of 51 specific questions with a 2-point scale. Knowledge of participants was determined based on the number of correct answers in each part. Each correct answer was scored 1 and each wrong answer or unanswered question was scored zero. While score range was between 0 and 51, a higher score reflected higher knowledge about antibiotic prophylaxis. For the knowledge, total score of less than 25% was not at all desirable, 25–49.9% was undesirable and 50–74.9% was relatively desirable and 75% and higher was considered as desirable. The questionnaire included items about heart disease and dental procedures which need prophylaxis and the type, dose, method of administration and time of administration for the proposed antibiotic to prevent IE. All points for the knowledge and attitudes of each participant were calculated [22].Independent t-test, one-way ANOVA, Fishers' exact test and chi-square tests were used for analyzing data. Level of statistical significance was set at less than 5% and all the analyses were performed in SPSS version 16.We performed post hoc tests following the one-way ANOVA. For pairwise comparisons, Tukey's Honestly Significant Difference (HSD) test was specifically employed.

Ethics committee of Hamadan University of Medical Science approved this study protocol. Approval number was UMSHA.REC.1394,44. All of participants signed written informed consent.

Result

Overall, 420 physicians and dentists participated in this study: 140 general medical practitioners (33.3%), 140general dental practitioners (33.3%), 70 dental specialists (16.7%) and 70 cardiologists (16.7%). Ages of participants were between 30 and 59 with a mean age of 39.2±6.7, 63.1% of them being in the age group of 30 to 40 years old. 51.2% of participants were female. 46.6% 0f participants were working in Hamadan and 53.6% of them were working in Tehran with an average work experience of 12.1±6.6. 47.4% of participants had less than 10 years of work experience and 41.4% had 10 to 20 years of work experience. Proportion of level of knowledge and attitude about and toward antibiotic prophylaxis in cardiac patients undergoing dental treatment is shown in Table 1. The results showed that knowledge of 86.7% of all participants was 'relatively desirable', only 10.5% was evaluated as 'desirable', and 2.9% as 'undesirable'. Regarding attitude, 11.4% of the studied population was found to have a 'good' attitude, 30% 'average' and 58.6% 'poor'. Comparing the level of knowledge about antibiotic prophylaxis in cardiac patients undergoing dental treatment in relation to demographic data is presented in Table 2. There was a significantly difference between level of knowledge and demographic variables such as gender, age, occupational groups and work experience ($P<0.001$). Female participants had a higher level of knowledge compared to male participants. Also, younger participants had a higher level of knowledge compared to the older participants. Dentists (particularly dental specialists) had a higher level of knowledge than other participants. Participants with less

Table 1 Proportion of knowledge and attitude levels regarding antibiotic prophylaxis in cardiac patients undergoing dental treatment among dental practitioners, dental specialists, general medical, and cardiologists

Variables		*N*	%
Knowledge	Undesirable	12	2.9
	Relatively desirable	364	86.7
	Desirable	44	10.5
Attitude	Poor	246	58.6
	Average	126	30
	Good	48	11.4

Table 2 Comparing the level of knowledge in relation to demographic information

Variables		Desirable *N* (%)	Undesirable *N* (%)	Relatively desirable *N* (%)	*P* value
gender	Female	27 (61.4)	1 (8.3)	187 (51.4)	0.005
	Male	17 (38.6)	11 (91.7)	177 (48.6)	
age	30–40	40 (90.9)	0	225 (61.8)	< 0.001
	41–50	4 (9.1)	3 (25)	118 (32.4)	
	51–60	0	9 (75)	21 (5.8)	
profession groups	dental practitioner	7 (15.9)	1 (8.3)	132 (36.3)	< 0.001
	dental specialists	32 (72.7)	1 (8.3)	37 (10.2)	
	general practitioners	0	10 (83.3)	130 (35.7)	
	cardiologists	5 (11.4)	0	65 (17.9)	
Work experience	< 10	29 (65.9)	0	170 (46.7)	< 0.001
	10–20	15 (34.1)	2 (16.7)	157 (43.1)	
	20–30	0	10 (83.3)	37 (10.2)	
Work place	Hamadan	23 (52.3)	3 (25)	169 (46.4)	0.244
	Tehran	21 (47.7)	9 (75)	195 (53.6)	

Table 3 Comparing the attitudes in relation to demographic information

Variables		Good *N* (%)	average *N* (%)	Poor *N* (%)	*P* value
gender	Female	32 (66.7)	80 (63.5)	103 (41.9)	< 0.001
	Male	16 (33.3)	46 (36.5)	143 (58.1)	
age	30–40	42 (87.5)	79 (62.7)	144 (58.5)	0.002
	41–50	5 (10.4)	41 (32.5)	79 (32.1)	
	51–60	1 (2.1)	6 (4.8)	23 (9.3)	
profession groups	dental practitioner	5 (10.4)	56 (44.4)	79 (32.1)	< 0.001
	dental specialists	25 (52.1)	36 (28.6)	9 (3.7)	
	general practitioners	0	4 (3.2)	136 (55.3)	
	cardiologists	18 (37.5)	30 (23.8)	22 (8.9)	
Work experience	< 10	32 (66.7)	70 (55.6)	97 (39.4)	< 0.001
	10–20	16 (33.3)	47 (37.3)	111 (45.1)	
	20–30	0	9 (7.1)	38 (15.4)	
Work place	Hamadan	22 (45.8)	59 (46.8)	114 (46.3)	0.992
	Tehran	26 (54.2)	67 (53.2)	132 (53.7)	

work experience had a higher level of knowledge than others. Comparing the attitudes toward antibiotic prophylaxis in cardiac patients undergoing dental treatment in relation to demographic variables (gender, age, occupational groups and work experience) showed significant differences in the results ($P<0.001$) (Table 3). Female participants had a more positive attitude compared to male participants similar to younger participants compared to other participants. Participants with less work experience had a more positive attitude than others.

The results showed a statistically significant relationship between education and knowledge ($\chi^2 = 119.9$, degree of freedom=6 and $P<0.001$). In addition, outcomes demonstrated a statistically significant relationship between education and attitude ($\chi^2 = 195.2$, degree of freedom=6 and $P<0.001$). The data showed that 74.9% of the participants announced textbooks as a source of information in this field.

According to the latest guidelines of AHA, some diseases require antibiotic prophylaxis before dental procedures. On the other hand, antibiotic prophylaxis is not recommended for some other patients [29]. All of those conditions and dental treatments were questioned in our study (Tables 4 and 5).

Table 6 presents a comparison of the mean and standard deviation of the knowledge and attitude ratings among various professional groups in pairs. Based on the knowledge score results, the only statistically significant

Table 4 Correct answers on the cardiac disease conditions of the questionnaire which need antibiotic prophylaxis

	Cardiac disease	Correct answer %
1	All of congenital heart disease (CHD)	73.3
2	Unrepaired cyanotic CHD, including those with palliative shunts and conduits	66.3
3	Completely repaired CHD with prosthetic material or device by surgery or catheter intervention during the first 6 months after the procedure	98.1
4	Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device, which inhibits endothelialization	98.8
5	Pacemaker	76.8
6	Rheumatoid fever	10
7	Previous IE	93.6
8	Prosthetic cardiac valve	97.8
9	Rheumatic heart disease	5
10	Cardiac transplant recipients without valvulopathy	34.8
11	Cardiac transplant recipients with valvulopathy	98.3
12	Mitral valve prolapse	61.1
13	Cardiac bypass	71.1
14	Physiologic murmur	39.9

Table 5 Correct answers on the dental treatment of the questionnaire which need antibiotic prophylaxis

	Dental treatment	Correct answer %
1	Local anesthetic injections through infected tissue	87.8
2	Local anesthetic injections through noninfected tissue	39.9
3	Anesthetic injection block	30.3
4	PDL injection	26
5	Taking dental radiographs	96.4
6	Orthodontic band replacement	39.6
7	Placement of removable prosthodontics or orthodontic appliances	48.9
8	Adjustment of orthodontic appliances	64.7
9	Shedding of deciduous teeth	60.9
10	Tooth extraction	81.4
11	Bleeding from trauma to the lips or oral mucosa	32.2
12	Scaling and periodontal surgery	81.9
13	Endodontic procedures	84.7
14	Subgingival cord placement	99
15	Matrix replacement	81.4
16	Rubber dam replacement	58.5
17	Suture extraction	98.1

difference ($P=0.030$) is seen between Group 3 (general practitioners) and Group 4 (cardiologists). Otherwise, general practitioners possessed significantly higher knowledge than cardiologists. There was no statistically significant difference between the other groups.

The differences between Group 1 (dental practitioner) and Group 3 (general practitioners), Group 1 and Group 4 (cardiologists), and Group 2 (dental specialists) and Group 3 as well as Group 2 and Group 4 are statistically significant, according to the analysis of the mean difference of attitude scores. That is, compared to general practitioners and cardiologists, general and dental specialists have higher positive attitudes ($P=0.001$).

Table 6 Comparison of the mean and standard deviation of knowledge and attitude scores among different professional groups

Variable	Comparison Groups*		Mean Difference	*p*-value
Knowledge	Group 1	Group 2	942/0-	243/0
	Group 1	Group 3	892/0-	135/0
	Group 1	Group 4	501/0	753/0
	Group 2	Group 3	050/0	999/0
	Group 2	Group 4	443/1	064/0
	Group 3	Group 4	393/1	030/0
Attitude	Group 1	Group 2	313/0-	661/0
	Group 1	Group 3	106/2-	001/0
	Group 1	Group 4	942/0-	001/0
	Group 2	Group 3	793/1-	001/0
	Group 2	Group 4	357/2-	001/0
	Group 3	Group 4	564/0-	166/0

*Group 1 = dental practitioner; Group 2 = dental specialists; Group 3 = general practitioners; Group 4 = Cardiologists

According to the latest prophylactic regimen, oral amoxicillin is the first choice of antibiotic for patients without allergy, chosen by 55% of dental practitioners, 85.7% of dental specialists, 7.1% of general practitioners and 8.6%of cardiologists. Two grams of antibiotic was correctly administrated for prevention by 93.6% of dental practitioners, 95.7% of dental specialists, 97.9% of general practitioners and 24.3% of cardiologists. Also, 95.7% of dental practitioners, 100% of dental specialists, 20.7% of general practitioners and 100% of cardiologists administrated the antibiotic 30–60 min before procedures.

Discussion

Our study provided important new information about the attitudes and knowledge of cardiologists, general practitioners, dentists, and dental specialists in Tehran and Hamadan regarding the prophylaxis of endocarditis. The study also emphasizes how crucial it is for physicians, dentists, and cardiologists to work together when making decisions about whether to prescribe preventive antibiotics [30].

In order to achieve the best patient outcomes and reduce the dangers of antibiotic improper use, including toxicity and the evolution of resistance strains, an interdisciplinary approach is essential [31]. Since this was the first study to assess all four categories simultaneously, it presents an extensive overview of Tehran and Hamadan's existing knowledge and attitudes on endocarditis prophylaxis.

Our research indicates a significant gap in the attitudes and knowledge of healthcare providers in Tehran and Hamadan on the prophylaxis of endocarditis. These findings are in agreement with similar studies. Similar to our investigation, in research of Ahmadi-Motamayel et al. [22], the level of knowledge among dental practitioners about using drugs was average (relatively desirable) in Hamadan. Also, knowledge of dental practitioners about antibiotic prophylaxis was evaluated average (relatively desirable) in Tabriz by Eskandari et al. [17]. Results of Basir-Shabestari et al. [32] in Qazvin, showed that knowledge of dental practitioners was average (for 79.1%) and 'desirable' for 20.9% of them. Zadik et al's [14] results revealed that knowledge of dentists about the latest guidelines of AHA were relatively desirable (81.3%). The standardized educational frameworks, international dissemination of the American Heart Association guidelines—which are widely adopted and cited in dental education worldwide—as well as local and international continuing education programs and workshops aimed at improving dentists' knowledge of antibiotic prophylaxis are largely responsible for the similarities in findings across these studies.

The results among occupational groups showed that knowledge of dentists were more desirable compared to general practitioners and cardiologists. Cardiologists are experts at determining which patients with cardiac conditions have an increased risk of infection and inflammation. They are aware of the significance of prophylactic treatment with antibiotics for these patients who are at risk. However, their familiarity with the specifics of dental procedures and treatments may be limited. Cardiologists might not be fully informed on which dental procedures are more likely to result in bacteremia and which are less likely to do so. In order to protect patient safety, they might therefore choose to take a more cautious approach and err on the side of overprescribing prophylactic antibiotics [33]. Therefore, improved education and more training programs seem necessary. It appears that dentists' knowledge is more desirable due to their educational focus and professional practice. They receive targeted instruction on the prophylaxis of antibiotics, particularly with regard to operations that carry a risk of bacteremia. Their higher knowledge levels are probably a result of their specialized education. Due to the nature of their work, dentists are also more familiar with administering dental treatments, and they regularly manage patients who need prophylactic antibiotics, which helps them to reinforce their knowledge through real-world application.

The mean level of knowledge regarding antibiotic prophylaxis for general practitioners was 52.59, 64.22 for dental practitioners, 72.72 for dental specialists and 66.36 for cardiologists. These levels reveal effectiveness of education on knowledge of Endocarditis Prophylaxis.

It's possible that scope of practice and continued education are the main causes of general practitioners' and cardiologists' lower knowledge levels. Cardiologists and general practitioners manage a broad spectrum of disorders; antibiotic prophylaxis for dental treatment may not be their top priority. Furthermore, these practitioners could have less options for continuing education that explicitly address the connection between endocarditis prophylaxis and dental care. Their levels of knowledge could be raised by strengthening these educational programs.

The results showed that attitude of 58.6% of all participants were 'poor'. The relationship between attitude and occupational groups was statistically significant. Dental specialists had a more positive attitude toward the subject compared to the other groups. In other words, the findings of this study suggest that majority of physicians and dentists do not believe in the effectiveness of antibiotic prophylaxis for IE or consider its effects mostly as negative. In this regard, results of Tong et al. [34] showed that there is insufficient evidence to confirm the effects of antibiotic prophylaxis. However, more research is recommended in this field.

According to the latest guidelines of cardiac America (AHA), some diseases such as history of IE and prosthetic valves require antibiotic prophylaxis before dental procedures. On the other hand, antibiotic prophylaxis is not recommended for some other patients including those involved with Rheumatic heart disease and pacemakers [35]. Results revealed that 95.7% of dentists did not administer antibiotics for physiologic murmur which is higher than Hashemipour study (13.3%) [18]. The guidelines for antibiotic prophylaxis have undergone revisions and clarifications since the Hashemipour report was published in 2007. Higher findings in our study could be explained by a number of factors, including improved communication channels, increased knowledge and education, and an emphasis on evidence-based practice. Similar to our study, Lauber and Hashemipour found that, for dentists, the most common conditions for prophylaxis were prosthetic valves and previous IE. This could be due to the importance of these conditions in various sources and the fact that recent protocols are not changed in this regard [18, 36]. While pace makers do not need prophylaxis, awareness level was found to be low in our study similar to Hashemipour's study [18]. The reason for this could be fear and an overly cautious approach to patients who have pacemakers because these devices are critical. Healthcare professionals may choose to be cautious rather than confident in their ability to forego prophylaxis when it is not required. Training curricula may not adequately address the particular

recommendations regarding pacemakers, which could lead to knowledge gaps. Some congenital heart diseases for dental specialists, general physicians and cardiologists were found to be the most common cases which require antibiotic prophylaxis. Our study showed that knowledge of medical physicians and cardiologists about Rheumatic fever, rheumatic heart disease and cardiac transplant recipients without cardiac valvulopathy was low. Also, it was found that medical physicians and cardiologists prescribe antibiotic for such diseases. This is consistent with the findings of Lauber et al. where more than 90% of physicians and dentists prescribed antibiotics for prosthetic valves and previous IE. Also, 60% of physicians and 40% of dentists prescribed antibiotic prophylaxis for cyanotic cardiac disease [36]. The lack of awareness among cardiologists and medical physicians may be due to outdated approaches or insufficient revisions to their professional training. In the present research, for dentists and physicians, endodontic treatment, gingival retraction cords, scaling, surgery and extraction were the most common dental procedures which needed antibiotic prophylaxis. Rate of knowledge for endodontic treatments and retraction cords in our study was higher than Hashemipour research [18]. This could be the result of training programs in this field getting better over time. Tong found that 28% of cardiologists and physicians were not familiar with dental treatments and use of antibiotic prophylaxis for them [34]. One possible explanation for this could be the relatively restricted engagement and communication between dentistry and medical experts, which has resulted in knowledge gaps regarding cross-disciplinary guidelines.

Amoxicillin was the first choice for about 55% of dental practitioner and 85.7% of dental specialists in our study. As the first choice for prophylaxis, Amoxicillin was used in all susceptible patients by 65.8% of dentists in Hashemipour, 95% in Lauber and only 36% in Vuille's studies [18, 36, 37].Lauber's study showed that 71% of physicians, 88% of dentists and 48% of physician selected Amoxicillin for prophylaxis with the correct dose and prescription time [18]. The same preference for Amoxicillin can be explained by the fact that it is a commonly prescribed and conveniently accessible antibiotic for prophylaxis, which is indicative of regional dental practitioners' standard prescribing procedures and training. Different rates of results could be the consequence of more successful continuing education projects in the various study locations, or regional differences in the distribution and adherence to guidelines.

There were many problems and limitation in our study including some dentists and physicians did not cooperate. Furthermore, social desirability bias could have affected the replies since participants might have given responses that were more in line with expectations than with their actual knowledge and viewpoints. Although the 420 individuals in the current study is a sufficient sample size (with a response rate of 72.04%) to make relevant conclusions, a larger number of participants in future research could improve the generalizability of these findings and validate them further. Further research should be done in other cities and with various medical specialties in order to provide a more comprehensive overview of endocarditis prophylaxis knowledge and attitudes across different target groups.

Conclusion

The results have shown that most of the participants had relatively desirable knowledge and more than half of the participants in this study had a poor attitude. Regarding knowledge, no statistically significant differences were found between the other categories, but general practitioners had significantly higher knowledge than cardiologists. In terms of attitudes, compared to dentists and dental specialists, cardiologists and general practitioners showed significantly poorer attitudes. Moreover, concerning endocarditis prophylaxis in cardiac patients receiving dental care, dentists and dental specialists displayed more positive attitudes than general practitioners and cardiologists. Based on the results, we suggest considering more training programs about the latest Antibiotic prophylactic regimen suggested by Heart Association for all groups of dentists and physicians. This regimen included in the Appendix B of this paper to ensure it is clearly presented for reference by practitioners.

Abbreviation

IE Infective endocarditis

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

Fatemeh Ahmadi-Motamayel had responsible for Supervision, Project administration, Writing – review and editing, Validation, Methodology. Shima Fathi had responsible for Investigation, Writing – original draft preparation, Validation, Data Curation, Visualization, Methodology. Ghodratollah Roshanaei had responsible for Conceptualization, Methodology, Software, Formal Analysis, Visualization. All authors reviewed the manuscript.

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Data availability
The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethics committee of Hamadan University of Medical Science approved this study protocol. Approval number was UMSHA.REC.1394,44. All of participants signed written informed consent.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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