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Dentists' knowledge, attitudes, and practices regarding antithrombotic drugs: pre-post test study

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Abstract

Background Dentists often treat patients taking antithrombotic medications. It's important to manage these medications carefully in dental clinics to reduce the risk of bleeding or blood clots. This study aimed to evaluate the effect of training by a clinical pharmacist on dentists' knowledge, attitudes, and practices regarding antithrombotic drugs.

Method This pre-post test study was conducted in Oral and Dental Health Centers (Istanbul/Turkey). A self-structured questionnaire consisting of 49 questions prepared by the researchers was used. This questionnaire was administered twice in a face-to-face setting, before (pre-test) and after (post-test) the 45-minute training given by the clinical pharmacist.

Results The median age of 238 dentists was 37.9 (27–58) years and 76% were female. The participants' knowledge of antithrombotic drugs was low (13.2%) but increased significantly after the training (91.7%) and Cronbach alpha value of this section was found to be 0.684. Before the training, only 13.2% of the participants believed that aspirin treatment should not be stopped before dental procedures. After the training, this percentage increased significantly to 89.3%. Similarly, the number of participants who correctly answered the question "Should warfarin be stopped before dental treatment?" also increased significantly from 13.2% before the training to 55.6% after the training ($p < 0.05$).

Conclusion The data obtained in our study showed that dentists' knowledge and attitudes toward antithrombotic drugs improved significantly after receiving training from the clinical pharmacist.

Keywords Antithrombotic, Attitude, Clinical pharmacist, Dentists, Knowledge, Practices

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Introduction

From the day they enter clinical practice, dentists often encounter patients with chronic diseases, most commonly cardiovascular diseases [1, 2]. With the increase in life expectancy in society, the number of people with chronic diseases is increasing daily [3]. A significant proportion of individuals with chronic diseases are long-term users of antithrombotic drugs, which are designed to prevent clot formation or dissolve existing clots to prevent arterial and venous thrombosis [4].

Antithrombotic agents are categorized based on their mechanism of action as antiplatelet, anticoagulant, and thrombolytic drugs [5]. Antiplatelet agents, such as aspirin, dipyridamole, and clopidogrel, inhibit chemical signals that promote aggregation [6]. Anticoagulants, such as heparin and warfarin, prevent new thrombus formation by impeding clotting mechanisms. Heparin and warfarin are drugs that prevent thrombosis in vivo, interfere with in vitro coagulation tests, and require laboratory monitoring [7]. Direct-acting oral anticoagulants (DOACs), such as dabigatran and rivaroxaban, target specific factors and do not require regular monitoring, thereby enhancing patient compliance [8].

The number of geriatric patients seeking dental care is increasing due to longer life expectancy. At the same time, the new definition of oral health and the better clarification of the relationship between general health and oral health place a responsibility on dentists to keep abreast of the current evidence-based literature and to assess the risk of thromboembolism and bleeding associated with dental treatment in their patients on antithrombotic drugs [9]. While discontinuation of antithrombotic treatment increases the risk of thrombotic complications, it should be noted that uninterrupted antiplatelet treatment increases the risk of bleeding after dental procedures [1, 10]. Bleeding risk refers to prolonged, excessive bleeding or bleeding that is not controlled by initial hemostasis [11]. Many studies have shown that dentists have legitimate concerns and confusion about the management of antithrombotic therapy [2, 12, 13]. However, current guidelines for dentists on international and national antithrombotic management are lacking in the literature [14, 15]. Despite these negative conditions, providing optimal dental care to patients receiving antithrombotic treatment is important. Therefore, the risks and benefits of antithrombotic agents should be weighed before starting dental treatment, and the management of dental patients on antithrombotic agents should be optimized, although existing guidelines exist to ensure this, new guidelines are also needed [11, 16]. In addition, more than half of the dentists in one study reported that they did not know the International Normalized Ratio (INR) and needed guidance [17]. Another study found that familiarity with all antithrombotic drugs, especially DOACs, was significantly low and that treatments were not according to guidelines [18].

During major oral surgery procedures, patients taking antithrombotic drugs are at low risk for peri- and postoperative bleeding events, which can be easily controlled with the use of local hemostatic measures. For this reason, it is not recommended to change the dose or use of antithrombotic drugs [19– 21]. Nevertheless, it has been noted that dentists in the past and present have resorted to discontinuing antithrombotic drugs due to concerns about the risk of bleeding [22]. In another study, the level of awareness was found to be around 5%, and 87.6% of dentists stated that they would like to attend training that would provide up-to-date information [23].

After a comprehensive literature review, it was found that dentists' knowledge of the management of patients on antithrombotic drugs is low and their awareness of the potential of antithrombotic drugs is not at the desired level [24].

Aim

Medication counseling is an important responsibility of clinical pharmacists. This study aimed to evaluate the impact of training provided by a clinical pharmacist on dentists' knowledge, attitudes, and practices concerning antithrombotic drugs.

Ethics approval

This pre-post study was approved by a local ethics committee (SBÜ-HBAEK-23/62) and Istanbul Provincial Health Directorate (26.09.2023-2023/15).

Methods

This pre-post study was approved by a local ethics committee and was conducted between February 1 and March 1, 2024. Dentists working in Oral and Dental Health Centers (ODHCs) affiliated with the Istanbul Provincial Health Directorate participated in the study and informed voluntary consent was obtained. This study was conducted by the Declaration of Helsinki.

In this study, it was determined that 152 dentists should be reached by predicting a 50% response distribution to obtain a 5% margin of error and 95% confidence interval (http://www.raosoft.com/samplesize.html, accessed 12.12.2022). The attrition rate was calculated to be 10% and 168 dentists were planned to be recruited in the study. A total of 238 dentists attended the training sessions and 205 completed both the pre- and post-tests.

Contents of the survey

In this study, a questionnaire titled "Evaluation of dentists' level of knowledge, attitude and application of antithrombotic drugs" developed by the researchers by utilizing current studies in the literature was used [6, 9,

25–27]. The questionnaire was not published anywhere and the English version of the questionnaire was in Appendix A.

The consensus method was used to assess the reliability of the survey [7, 28]. After the survey was created, it was sent to 20 dentists. An oral and maxillofacial surgeon and a cardiologist were consulted to determine the face and content validity of the questionnaire. The survey consists of 49 items in 4 parts: (1) Demographic information (5 items), (2) Level of knowledge about antithrombotic drugs (22 items), (3) Attitudes (7 items), and (4) Clinical practices (15 items). A pilot study was conducted to assess the feasibility of the survey.

Collection of survey data

The survey was administered twice, each test was answered in about 6–7 min. The pre-test was administered prior to the education, and the post-test was conducted on the same day, immediately following the education. However, since all the physicians we trained worked in different hospitals with busy schedules, it was difficult to reach them again. Therefore, participants completed the survey online by scanning the QR code provided after the training.

The education was provided by the clinical pharmacist (F.U.Y.), who has been trained in antithrombotic drugs for 3 years. The content of the education included detailed information on the pharmacotherapy of antithrombotic drugs, practice in dental practice, recommendations for the prevention of complications and management of treatment (decision processes for stopping or continuing the drugs, adverse effects, etc.).

The participants who completed the pre and post-tests were matched with the numbers given according to the ODHCs they worked.

Training on the "Rational use of antithrombotic drugs in dental practice" included general pharmacological information about antithrombotic drugs (effects, duration of action, indications, and monitoring parameters) as well as points that dentists should be mindful of when treating patients who are taking antithrombotic drugs.

The content of the education included detailed information on the pharmacotherapy of antithrombotic drugs, practice in dental practice, recommendations for the prevention of complications and management of treatment (decision processes for stopping or continuing the drugs, adverse effects, etc.). In light of this information, association resources, current guidelines (AHA, ADA, NICE) and databases (Lexicomp, PubMed, UpToDate) were used while preparing the education presentation [29]. The training was delivered in person with an oral presentation lasting approximately 45 min.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) version 15.0 was used for analysis. Among the sociodemographic data of the participants, mean age and professional tenure are expressed as medians, as they do not follow a normal distribution. Other socio-demographic data are expressed as percentages. Knowledge levels, attitudes and practices before and after the training were analyzed using the McNemar test. The results were evaluated at the 95% confidence interval and the significance level was $p < 0.05$.

Results

A total of 205 dentists participated in the study. The mean age of the participants was 37.9 years (27–58 years) and 76% were female. The mean professional tenure was 13.3 years [1–35]. The majority of participants (87%) reported seeing more than 10 patients per day.

Dentists' knowledge of antithrombotic drugs

Dentists' knowledge level about antithrombotic drugs was evaluated with a total of 22 questions and the Cronbach alpha value of this section was found to be 0.684. Before the training, approximately 75% of the participants did not know the active ingredients in the antithrombotic drug group and the names of the existing drug preparations. After the training, this rate was 91.7% and this increase was statistically significant ($p < 0.001$).

It was observed that after the training, the correct response rate of dentists to questions about the use of antithrombotic drugs before dental treatment increased significantly ($p < 0.001$) (Table 1). Although the answers included yes, no and I don't know, no dentist chose to mark the I don't know option.

Dentists' attitudes toward antithrombotic drugs

While 53.7% of the participants stated before training that the management of patients on antithrombotic drugs was "a little more difficult" than other patients, most of them (83.9%) stated after training that the management of these patients was "similar to other patients". It was observed that the rate of participants who were concerned about the side effects of "bleeding" during invasive dental procedures decreased significantly after the training ($p < 0.05$).

While the majority of the participants stated that they needed 'clinical guidelines' to use in clinics before the training, the rate of dentists who agreed with the existence of this need increased after the training. The attitudes of the participants are shown in Table 2.

After the training given by the clinical pharmacist, there was a significant increase in the number of dentists who said that patients using antithrombotic drugs could consult a "pharmacist" before dental treatment compared

Table 1 Knowledge of antithrombotic drug use

Questions	Pretest %($n=205$)	Posttest %($n=205$)	
	Yes No	Yes No	*p*
Do you know what a coronary stent is?	14.1 (29) 85.8 (176)	98.5 (202) 1.5 (3)	*< 0.001*
Do you know what the active ingredient is in any of the drugs called Ecopirin, Plavix, Karum, or Opirel?	13.7 (28) 86.3 (177)	91.7 (188) 8.3 (17)	*< 0.001*
Do you know what acetylsalicylic acid (Aspirin) is?	16.1 (33) 83.9 (172)	99 (203) 1 (2)	=0.691
Do you know what clopidogrel is?	16.1 (33) 83.9 (172)	96.1 (197) 3.9 (8)	*< 0.001*
Do you know what prasugrel is?	14.6 (30) 85.3 (175)	93.2 (191) 6.8 (14)	*< 0.001*
Do you know what ticagrelor is?	12.2 (25) 87.8 (180)	88.8 (182) 11.2 (23)	*< 0.001*
Should aspirin be stopped before having dental work done?	72.7 (149) 27.3 (56)	0.5 (1) 99.5 (204)	*< 0.001*
Should clopidogrel-prasugrel-ticagrelor treatment be stopped before dental treatment?	73.2 (150) 13.2 (27) 13.7 (28)	1 (2) 9.3 (19) 89.8 (184)	*< 0.001*
Antithrombotic treatment should be completed before the procedure.	45.4 (93) 37.6 (77) 17.1 (35)	64.4 (132) 19 (39) 16.6 (34)	*< 0.001*
I consult a cardiologist before stopping the antiplatelet drug(s).	87.3 (179) 12.7 (26)	91.7 (188) 8.3 (17)	=0.164
Do you know the consequences of stopping antiplatelet therapy?	0 100 (205)	93.7 (192) 6.3 (13)	*< 0.001*
Do you know the rate of stent thrombosis after stopping antiplatelet therapy?	1 (2) 99 (203)	90.7 (186) 9.3 (19)	*< 0.001*
Do you know the mortality rate associated with stent thrombosis?	8.3 (17) 91.7 (188)	91.7 (188) 8.3 (17)	*< 0.001*
Do you know how important dual antiplatelet therapy is in preventing thrombosis after stent implantation?	6.3 (13) 93.6 (192)	97.6 (200) 2.4 (5)	*< 0.001*
Are you aware of guidelines from international medical societies (AHA, ADA, ESC)?	0.5 (1) 99.5 (204)	95.1 (195) 4.9 (10)	*< 0.001*
Do you know the indications for oral anticoagulant drugs?	4.4 (9) 95.6(196)	98.5 (202) 1.5 (3)	*< 0.001*
Heparin treatment should be interrupted before dental treatment.	46.3 (95) 53.7 (110)	11.7 (24) 88.3 (181)	*< 0.001*
Direct-acting oral anticoagulant therapy should be discontinued before dental treatment.	40.5 (83) 60.5 (122)	32.2 (66) 67.8 (139)	=0.090
Warfarin treatment should be stopped before dental treatment.	40 (82) 60 (123)	28.3 (58) 71.7 (147)	=0.024
Do you know which parameters should be monitored when taking antithrombotic drugs?	10.2 (21) 89.8 (184)	96.1 (197) 3.9 (8)	*< 0.001*
Do you know the acceptable INR for safe dental treatment in terms of bleeding?	1 (2) 99 (203)	98.5 (202) 1.5 (3)	*< 0.001*
Do you know which local anesthetics to choose for patients on antithrombotic drugs?	15.1 (31) 84.8 (174)	95.1 (195) 4.9 (10)	=0.907

n: number of participants, AHA: American Heart Association, ADA: American Dental Association, ESC: European Society of Cardiology INR: international normalized ratio, McNemar analysis was performed.

Table 2 Attitudes toward the use of antithrombotic medication

Questions	Pretest %(*n*)	Posttest %(*n*)	*p*
How would you rate the difficulty of managing patients on antithrombotic drugs compared to other patients?			*< 0.001**
Much more difficult	36.1(74)	0	
A little more difficult	53.7(110)	6.3 (13)	
Similar in terms of difficulty	9.8(20)	83.9 (172)	
A little easier	0	9.8 (20)	
Very easy	0.5 (1)	0	
Which patients with cardiovascular disease do you think are the most difficult to manage?			*= 0.357**
Patients on blood thinners	30.2 (62)	26.8 (55)	
Patients with arrhythmia	2.9 (6)	1 (2)	
Those with coronary artery disease and those who have had a heart attack	33.2 (68)	35.6 (73)	
Patients who have had previous heart surgery	13.2 (27)	14.6 (30)	
Patients with valve problems	20.5 (42)	22 (45)	
Do you need clinical guidelines?			*= 0.015***
Yes.	87.6(179)	94.6 (194)	
No.	12.4 (26)	5.4 (11)	
Which factor is of greatest concern when performing invasive dental procedures in patients on antithrombotic therapy?			*= 0.001**
Risk of intraoperative bleeding	8.3 (17)	5.4 (11)	
Risk of postoperative bleeding	24.9(51)	10.2 (21)	
Risk of thromboembolic events (stroke, myocardial infarction)	66.8(137)	84.4 (173)	
Would you recommend that the dental curriculum include management guidelines and current approaches for patients taking antithrombotic medications before dental treatment?			= 0.625**
Yes.	98.5(202)	99.5 (204)	
No.	1.5 (3)	0.5 (1)	

n: number of participants, *Wilcoxon analysis, **McNemar analysis

to before the training [(0.5%, $n=1$), (14.6%, $n=30$)] ($p<0.05$).]

Dentists' practice toward antithrombotic drugs

94% of the participants stated that patients taking at least one antithrombotic drug per day were planning dental treatment. 35% ($n=73$) of the dentists participating in the study stated that they had previously encountered a patient with urgent symptoms related to a cardiac condition.

72% of the participants reported that they had not received training in the use of antithrombotic drugs, and 89% reported that they would like to receive training. Only 21% ($n=43$) of dentists reported requiring routine blood tests in patients taking antithrombotic drugs, and 83.7% of them monitored the INR test. In addition, the majority of dentists (95%) reported that they would like to stop the use of surgical drugs in patients taking antithrombotic drugs. 57% of the participants reported referring their patients to a cardiologist prior to dental treatment (Table 3).

While about 50% of the participants reported that they decided to postpone non-invasive dental treatment in patients taking antithrombotic drugs, the dentists' decision to continue using the drug and perform dental treatment changed with the increase in knowledge after the training ($p<00.1$).

Discussion

Antithrombotic drugs are widely used for a variety of conditions and may cause some problems in dental treatment due to side effects, primarily an increased risk of bleeding [30]. The dental treatment of patients using these drugs should be managed rationally. Dentists and pharmacists are primary care providers for patients within a health care system. Due to increased life expectancy and chronic diseases, the number of geriatric patients seeking dental care has increased [11]. To treat these patients safely and effectively, dentists need up-to-date, evidence-based information about antithrombotic drugs. To properly apply the current theoretical knowledge in practice, the dentist should evaluate the risks and benefits of antithrombotic agents before starting dental treatment [11]. As the potential negative consequences of a blood thinner drug holiday is death and that bleeding secondary to dental surgery can be reasonably, successfully managed, several authors have strongly argued against such a drug holiday. At the same time, dentists can play an important role in the detection of disease by choosing the right clinical practice [9]. Various guidelines have suggested management approaches for these patients, but no standard management has been defined [18]. Dentists are concerned about the risk of thromboembolism if these drugs are stopped before dental procedures and the risk of long-term bleeding if they are continued [31, 32].

Table 3 Practices of dentists

Questions	Pretest %(*n*)	Posttest %(*n*)	*p*
What is your general approach to cardiac patients who come to your clinic?			*p* < 0.001*
I want advice from an experienced dentist.	1.5 (3)	0	
I refer them all to more experienced colleagues	1.5 (3)	0	
I provide and manage treatment management for all patients	8.8 (18)	33.2 (68)	
I provide treatment management for some patients	31.7 (65)	38 (78)	
I refer them all to a cardiologist before any procedure	56.6 (116)	28.8 (59)	
Regardless of the medication taken by the patient, if the blood tests are within therapeutic limits, will you perform the dental treatment?			*p* < 0.001**
Yes	48.8 (100)	79.5(163)	
No	51.2 (105)	20.5 (42)	
What is your approach to a patient presenting for noninvasive dental treatment who is on antithrombotic drugs?			*p* < 0.001*
Delay treatment.	47.8 (98)	1.5 (3)	
Refer the patients to their physician for a pre-procedure evaluation.	49.3 (101)	27.3 (56)	
Continue medication and dental treatment.	2.9 (6)	71.2(146)	
What is your approach to a patient presenting for an invasive dental procedure who is on antithrombotic drugs?			*p* = 0.043*
Delay treatment	5.4 (11)	2.4 (5)	
Refer the patients to their physician for a pre-procedure evaluation	88.3 (181)	87.3(179)	
Continue medication and dental treatment	6.3 (13)	10.2 (21)	

n: number of participants, *Wilcoxon analysis, **McNemar analysis

There are national and international studies in the literature investigating dentists' knowledge of antithrombotic drugs and their attitudes and practices toward patients undergoing this treatment [24–26]. However, there is a paucity of studies investigating the effect of pharmacist education on antithrombotic drugs. Pharmacists are valuable healthcare professionals who can provide drug counseling to all healthcare professionals, including dentists. Our study evaluated the effect of pharmacist-provided training on dentists' knowledge, attitudes, and practices regarding the use of antithrombotic drugs.

Knowledge of the use of antithrombotic drugs

Clopidogrel is one of the most widely used antithrombotic drugs. There are studies in the literature in which the recognition rate of clopidogrel and its preparation by dentists is quite low (8%, 21%) [26, 33]. In our study, recognition of clopidogrel increased from 16 to 96% after training. Similarly, the recognition rate of products containing clopidogrel increased from 14 to 92%.

In the present study, while the rate of participants who knew the indications for warfarin before the training was less than 5%, after the training, the rate increased to 99%. Another study conducted in Sudan, which assessed knowledge levels, found that more than half of dentists (56.6%) had good knowledge of how to manage patients taking warfarin, and most (86%) knew the indications. However, the same study concluded that about half of the dentists (49%) had inadequate knowledge of the management of patients on warfarin [25].

Studies in the literature have shown that, among antithrombotic drugs, dentists have the least knowledge about DOACs (approximately 10%), and they know most about aspirin (approximately 75%) [7, 18, 23, 24, 27]. In our study, in line with the literature, the highest level of knowledge (33%) was found for aspirin and the lowest level of knowledge (9%) was found for DOACs. A study conducted in Turkey reported that prasugrel and ticagrelor, which are commonly used in antiplatelet therapy, were not recognized by 2% of the dentists participating in their study [27].

In our study, the rate of dentists who knew about these drugs was less than 15% before training but increased to 90% after training. The reason for this may be that aspirin is often prescribed as the oldest antiplatelet available in practice and dentists are not often exposed to drugs that have entered the market later.

In this study, 14% of dentists were aware of coronary stents before training, but this increased to 98% after training. Another study found this rate to be 89%, which is consistent with our research [26].

According to the Northwest Drug Information Centre guidelines, it is safe to perform dental treatment in primary care for patients with an INR < 4.0 on warfarin without dose interruption [34]. The literature has shown that 20-50% of dentists have this knowledge [17, 25]. However, in our study there was only one dentist who was aware of this safe limit before training, but almost all dentists reported being aware of it after training. One study found that the majority of dentists (84%) did not

consider it necessary to ask for an INR prior to dental treatment [24]. Similarly, in our study this rate was 83%.

Although antithrombotic drugs cause increased bleeding, there is a consensus that treatment should not be discontinued [13]. By consulting experts, we assessed the level of agreement, consistency, and language quality for each item to identify those that positively or negatively impact the overall quality of the questionnaire. In addition, several studies have found that the problems associated with stopping antithrombotic drugs during dental treatment are unknown [18, 23, 26, 27, 35]. In our study, in line with the literature, the rate of participants who were aware of stent thrombosis, one of the problems that can occur when discontinuing these drugs, increased from 1 to 90% after training. These results suggest that interprofessional education plays an important role in preventing potential problems with antithrombotic drugs.

Warfarin has a higher risk of postoperative bleeding than aspirin. Despite this, the rate of discontinuation of warfarin prior to dental treatment in our study was 41%, while the rate of discontinuation of aspirin was 73%. Similar results have been reported in the literature [18]. This result may be due to their more frequent use of aspirin to treat patients. However, after the clinical pharmacist training, these rates decreased significantly, which can be attributed to dentists being updated with evidence-based information.

In light of the results of our study and the information in the literature, we believe that dentists' knowledge of antithrombotic drugs should be improved and updated [22, 36, 37]. We believe that it would be beneficial to include a topic on the rational use of antithrombotic drugs in the undergraduate and postgraduate education content of dentists.

Dentists' attitudes toward antithrombotic drugs

In our study, the rate of dentists who knew that there were current guidelines on the use of antithrombotic drugs in dental practice increased from 1 to 95% after the training. This rate varies between 20 and 70% in different studies [26, 38]. In studies in the literature, the rate of dentists requesting the development of relevant clinical practice guidelines is between 50% and 90% [7, 17, 23, 24, 38, 39]. Similarly, in our study, the rate of dentists needing a practice guide and wanting current approaches to be included in the curriculum is over 90%.

Studies in the literature have shown that an average of 90% of dentists consult a physician before providing dental treatment to patients taking antithrombotic drugs [7, 17, 23, 24, 26, 27]. In our study, 57% of dentists reported referring their patients to a cardiologist prior to dental treatment. In light of these data, we can conclude that dentists who do not have sufficient knowledge on the subject are also timid in their attitude toward the patient.

Routine discontinuation of antithrombotic drugs prior to dental treatment may put these patients at risk of thromboembolism. In some studies, approximately 60% of dentists reported this risk as the most worrisome situation [7, 24, 27]. Similarly, in our study, 67% of dentists reported that the risk of thromboembolism was the most worrisome aspect of patient management. Thromboembolism causes dentists to have a fearful attitude toward these patients.

Dentists' practice toward antithrombotic drugs

Our study showed that about 50% of dentists would be comfortable with providing dental treatment if the patients' blood tests were within therapeutic limits. This result was similar to other studies (47%, 60%) [7, 27].

In our study, the rate of dentists requiring routine blood testing was only 21%. Similar to our results, a study of undergraduate and postgraduate dental students found that 50% of 4th year students and 81% of postgraduate students did not want routine blood tests [27].

We believe that dentists are reluctant to translate their theoretical knowledge into practice because the application of dental treatments requires a delicate balance between the risk of perioperative bleeding and the risk of thromboembolic complications.

In the literature, the rate of non-invasive dental treatments in patients using these drugs was reported to be 75% [7]. In our study, this rate was 3% before training and increased to 71% after training, which is consistent with the literature. We believe that the education provided contributed to this increase.

Our study has limitations, such as being carried out in a single province and not being able to achieve a large sample size due to the face-to-face training and the use of a survey.

Conclusion

In conclusion, after the training provided by the clinical pharmacist, it was observed that dentists' knowledge of antithrombotic drugs increased and their positive attitudes toward the use of these drugs during dental treatment improved. Based on the results of our study, we believe that the training provided by the clinical pharmacist can contribute directly to the dental practice and indirectly to the rational use of drugs. In addition, the present study demonstrates the importance of developing continuing education plans for dentists and developing an evidence-based multidisciplinary guideline.

Limitations

One limitation of the study is the insufficient number of participants to allow for subdivision into age groups,

specialties, and educational levels. A second limitation is the administration of the post-test immediately following the educational intervention, as the primary objective of this study was to raise awareness of the immediate and positive outcomes.

Abbreviations

DOACs	Direct-Acting Oral Anticoagulants
INR	International Normalized Ratio
ODHCs	Oral and Dental Health Centers
AHA	American Heart Association
ADA	American Dental Association
ESC	European Society of Cardiology
NICE	National Institute for Health and Care Excellence
SPSS	Statistical Package for Social Sciences

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-025-07087-w.

Supplementary Material 1

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Author contributions

Fatıma Ulya Yürük: Contributed to conception, design, data acquisition and analysis and interpretation, drafted and critically revised the manuscript. Songül Tezcan: Contributed to conception, design, data acquisition and analysis and interpretation, drafted and critically revised the manuscript. Ayşenur Cengiz: Contributed to conception, design, data acquisition and interpretation, drafted and critically revised the manuscript. Mesut Sancar: Contributed to conception, data analysis and drafted and critically revised the manuscript. All authors gave their final approval and agree to be accountable for all aspects of the work.

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Data availability

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

Declarations

Ethics approval and consent to participate

Hamidiye Scientific Research Ethics Committee, Hamidiye Institute of Health Sciences, University of Health Sciences, Istanbul, Turkey.

Competing interests

The authors declare no competing interests.

Consent for publication

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