

Knowledge and Attitudes of Oral Health Professionals to Different Dental Treatment Approaches in Bisphosphonate Therapy

Diş Hekimlerinin Bifosfonat Tedavisinde Farklı Dental Tedavi Yaklaşımlarına İlişkin Bilgi ve Tutumları

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ABSTRACT

Objective: This study evaluates oral healthcare professionals' attitudes towards managing different dental clinical scenarios considering different durations and administration routes of antiresorptive drugs.

Methods: This study is a cross-sectional, Web-based survey. The first part of the survey evaluated demographic data; the second part investigated dentists' medication-related osteonecrosis of the jaw (MRONJ) treatment approach; the third part comprised clinical treatment scenario questions regarding the administration route and duration of usage. Oneway ANOVA test was used in the intergroup comparison of parameters showing normal distribution, and Tamhane's T2 test was used to determine the group that caused the difference. Student t-test was used for comparison of parameters showing normal distribution. The chi-square test, Continuity (yates) correction, and Fisher Freeman Halton test were used to evaluate qualitative data. Significance was set at $P < .05$.

Results: 35.8% of dentists said they would not treat at-risk patients as the correct approach. More than half of the participants prefer to refer to the cases of osteonecrosis from the 1st stage to a specialist. A statistically significant difference was found between the correct answers about all five treatment scenarios for patients receiving oral bisphosphonate (BP) ≤ 3 years in favor of experienced dentists ($P < .05$).

Conclusion: Within the confines of this study, dentists' knowledge of BP and osteonecrosis is moderate. Dentists with less than ten years of working experience are more cautious about patients using BP due to the risk of developing osteonecrosis when different dental treatments are performed.

Keywords: Bisphosphonate, medication-related osteonecrosis of the jaw, awareness, survey
ÖZ

Amaç: Bu çalışma, diş hekimlerinin antirezorptif ilaçların farklı süreli kullanımını ve uygulama yollarını dikkate alarak farklı dental tedavi senaryolarını yönetme konusundaki tutumlarını değerlendirmektedir.

Yöntem: Bu kesitsel çalışmada uygulanan internet tabanlı anketin ilk bölümünde demografik veriler değerlendirildi. İkinci bölümde diş hekimlerinin ilaca bağlı olarak çene kemiğinde görülen osteonekroz (MRONJ) tedavi yaklaşımları incelendi; üçüncü bölümde ise bifosfonat (BP) uygulama yolu ve kullanım süresi ile ilgili farklı klinik tedavi senaryo soruları değerlendirildi. Normal dağılım gösteren parametrelerin gruplar arası karşılaştırmasında Oneway ANOVA testi, farklılığa neden olan grubun belirlenmesinde Tamhane's T2 testi kullanıldı. Normal dağılım gösteren parametrelerin karşılaştırılmasında Student t-testi kullanıldı. Niteliksel verilerin değerlendirilmesinde ki-kare testi, süreklilik (yates) düzeltmesi ve Fisher Freeman Halton testi kullanıldı. Anlamlılık $P < .05$ olarak değerlendirildi.

Bulgular: Diş hekimlerinin %35,8'i MRONJ riski altındaki hastaları doğru yaklaşım olarak tedavi etmeyeceklerini söyledi. Katılımcıların yarısından fazlası 1. aşamadan itibaren osteonekroz vakalarını bir uzmana yönlendirmeyi tercih ettiklerini bildirdiler. Oral BP ≥ 3 yıl alan hastalarda beş tedavi senaryosunun tamamına ilişkin doğru cevaplar arasında deneyimli diş hekimleri lehine istatistiksel olarak anlamlı bir fark bulundu ($P < .05$).

Sonuç: Bu çalışmanın sınırları dahilinde, diş hekimlerinin bifosfonatlar ve osteonekroz hakkındaki bilgileri orta düzeydedir. On yıldan az çalışan diş hekimlerinin, farklı diş tedavileri yapıldığında osteonekroz gelişme riski nedeniyle BP kullanan hastalar konusunda daha dikkatli yaklaştıkları tespit edildi.

Anahtar kelimeler: Bisfosfonat, ilaca bağlı çene kemiği osteonekrozu, farkındalık, anket

INTRODUCTION

In recent years, a potentially severe adverse effect, known as medication-related osteonecrosis of the jaw (MRONJ), was reported after administering bisphosphonates (BP) or denosumab to prevent bone complications or angiogenesis inhibitors.¹

BP is one of the most widely prescribed drugs. The first MRONJ cases of BP were reported in 2003.² BP strongly binds to bones, primarily remodeling bone surfaces.³ Since the maxilla and mandible have a high

bone turnover rate, an increased incidence of undesired effects, especially on the maxilla and mandible, as MRONJ, can be observed.⁴

Osteonecrosis of the jaw is a severe clinical condition characterized by bone exposure in the maxillofacial region.² The lesion is characterized by an area of exposed bone that presents for more than eight weeks with no history of radiotherapy.¹ MRONJ can be seen especially in patients using intravenous BPs, as well as in patients using long-term oral BPs.⁵ The frequency is high when using nitrogen-containing intravenous BPs such as pamidronate and zoledronate.^{6,7} In recent years, the increase in the prevalence of cancer and osteoporosis patients has led oral health professionals to encounter patients who use antiresorptive/antiangiogenic drugs in high numbers. Oral health professionals should be aware of the apparent risk and discrepancies in the dental treatment of such patients.

Osteonecrosis lesions can occur spontaneously or more frequently after an interventional dental procedure, such as tooth extraction and dentoalveolar surgery.⁸ Also, pre-existing chronic inflammatory conditions such as periodontal disease or periapical pathologies, dental trauma, ill-fitting removable dentures, interventions such as root canal treatments, surgical periodontal treatment, apical resection, and implant placement are factors that may accelerate the formation of osteonecrosis.⁹⁻¹¹ The incidence of MRONJ has been reported to decrease in patients with multiple myeloma and cancer when oral hygiene is achieved and improved.^{12,13} In addition to dental factors, systemic diseases and drug-related factors may also affect the risk of developing MRONJ.^{10,14-16}

Oral health professionals are understandably concerned about appropriately managing the care of patients receiving BP therapy. Typically, oral health professionals make decisions about different clinical cases (about diagnosis and management) every day. However, they might need clarification when they encounter patients under antiresorptive/antiangiogenic drug therapy. They need to be more noticeable and straightforward in day-to-day clinical practice.

A literature review reveals that most of the studies evaluated the knowledge of healthcare professionals about antiresorptive drug and their side effects as MRONJ. Any literature evaluated oral healthcare professionals' approaches to various dental treatments that may lead to MRONJ formation for different antiresorptive drug treatment protocols, including duration and administration route. This study evaluates oral healthcare professionals' attitudes about managing periodontal treatment, endodontic treatment, tooth extraction, including wisdom tooth, and implant placement in clinical scenarios considering different duration and administration routes of antiresorptive drugs.

METHODS

This cross-sectional web-based survey was conducted between September 2018 and January 2019. The study was approved by the research ethics board at İstanbul University (İstanbul University Cerrahpaşa Medical Faculty Medical School Ethical Board, Türkiye; Date: 17.08.2018, No: 46007).

The survey was conducted via the Turkish Dental Association. The power analysis was performed considering the number of dentists registered in the Turkish Ministry of Health. A minimum of 379 dentists was required to achieve statistical power. A written informed consent form was obtained from the participants. A total of 485 dentists replied to the survey; 100 participants were excluded due to missing answers and abandoning the test. The questionnaire was distributed and collected by a single researcher.

The survey was created based on the work of Al-Hussain et al.¹⁷, and similar published surveys were also considered.^{18,19} The 2014 American Association of Oral and Maxillofacial Surgeons (AAOMS) report was taken as a clinical guide.¹ The suitability and responses of the prepared questionnaire were evaluated by two periodontologists, two oral and maxillofacial surgeons, and one oral and maxillofacial radiologist based on the above-mentioned clinical guideline and then finalized. Pilot testing before the study was completed to ensure the validity of the survey, and this pilot sample was not included in the study population.

The survey consisted of three parts. The first part of the survey evaluated the demographic data of dentists, including their specialty and duration of the profession, and their dental treatment approaches in patients using antiangiogenic and antiresorptive drugs. In the second part, dentists' MRONJ treatment approach was evaluated based on the osteonecrosis staging and treatment strategies of the American Society of Oral and Maxillofacial Surgeons. The staging and related treatments were described briefly as: At Risk: no apparent necrotic bone (no therapy, just patient education), Stage 0: no clinical evidence of necrotic bone, non-specific clinical findings and radiographic changes (pain control and antibiotics), Stage 1: exposed and necrotic bone or fistulas that probe to the bone in patients without infection (antibacterial mouth rinse, clinical follow-up, patient education), Stage 2: exposed and necrotic bone or fistulas that probe to the bone in patients with infection (antibacterial mouth rinse, symptomatic treatment, pain control, debridement), Stage 3: exposed and necrotic bone or fistulas that probe to the bone in patients with pain and infection and also necrotic bone extending beyond the region of the alveolar bone, pathologic fracture, extra-oral fistula, oro-antral or oral nasal communication, osteolysis (antibacterial mouth rinse, symptomatic treatment, pain control, surgical debridement or resection). Considering this information, the participants were asked to determine their treatment preferences. The treatment preferences were as follows: no treatment, patient education, symptom treatment, mouthwash recommendation, antibiotic prescription, surgical debridement, and resection. The third part comprised clinical treatment scenario questions regarding the administration route and duration of usage. Clinical treatments of initial periodontal therapy, endodontic treatment, tooth extraction (both simple and impacted tooth), and implant placement were asked of the participants. For each treatment, four patient scenarios were created. Patient 1: oral BP usage ≤ 3 years, patient 2: oral BP usage > 3 years, patient 3: IV BP usage ≤ 3 years, patient 4: IV BP usage > 3 years. Recommended choice of treatments was as follows: performable, non-performable, consultation with the medical professional, performable after a drug holiday, and referral to a specialist. By presenting five different treatment options, one of the five recommended choices is expected to be selected for each patient.

Statistical analysis

The data were collected through a web-based (Survey Monkey) platform. The data was imported to IBM SPSS Statistics 22 for statistical analysis (IBM SPSS Corp., Armonk, NY, USA). The compliance of the parameters to the normal distribution was evaluated using the Shapiro-Wilks test. Besides descriptive statistical methods (mean, standard deviation, frequency), the Oneway Anova test was used in the intergroup comparison of parameters showing normal distribution, and Tamhane's T2 test was used to determine the group that caused the difference. Student t-test was used for comparison of parameters showing normal distribution. The chi-square test, Continuity (yates) correction, and Fisher Freeman Halton test were used to analyze qualitative data. Significance was set at $P < .05$.

RESULTS

Three hundred eighty-five dentists, 205 females, and 180 males, participated in the study. Their ages ranged from 23 to 64. Fifty-nine % of the participants' age was between 23-34. Seventy-four % of the participants were general dentists, whereas 26% had a specialist degree. The mainly observed specialty was oral surgeons (11.4%), followed by prosthodontists (3.9%), orthodontists (2.3%), periodontists (2.3%), pediatric dentists (1.8%), endodontists (1.3%), restorative dentists (1.3%), oral implantologists (1%) and oral radiologists (0.5%). Almost half of the participants (178, 46.2%) were performing their profession for less than five years. The participants' duration of occupation was between 6-10 (13.5%), 11-20 (15.6%), and more than 20 years (24.7%).

Table 1 presents the results of the questions related to the assessment of the knowledge of participants about osteonecrosis staging and related treatment approaches. 35.8% of the dentists said they would not treat patients at risk as the correct approach, and 70.1% stated that they would educate patients. More than half of the participants prefer to refer the cases of osteonecrosis from the 1st stage to a specialist. On the other hand, some dentists stated that they could manage all phases of osteonecrosis (Table 1). When this data was further evaluated and general dentists and specialists were compared, the data revealed a statistically significant higher rate in favor of specialists (Table 2, $P<.05$).

Table 1. BRONJ staging and approach to the patient according to the stage of osteonecrosis.

	n	%
At what stage would you refer a BRONJ patient to a specialist?	At risk (n=384)	117 30.5
	Stage 0 (n=383)	146 38.1
	Stage 1	197 51.2
	Stage 2	206 53.5
	Stage 3	210 54.5
	I can manage all stages of osteonecrosis.	45 11.7
At risk	No treatment	138 35.8
	Patient education	270 70.1
	Treat symptoms	114 29.6
	Mouth rinse	94 24.4
	Antibiotics	44 11.4
Stage 0	Surgical debridement/resection	11 2.9
	No treatment	140 36.4
	Patient education	235 61
	Treat symptoms	175 45.5
	Mouth rinse	134 34.8
Stage 1	Antibiotics	54 14
	Surgical debridement/resection	19 4.9
	No treatment	203 52.7
	Patient education	182 47.3
	Treat symptoms	150 39
Stage 2	Mouth rinse	145 37.7
	Antibiotics	84 21.8
	Surgical debridement/resection	28 7.3
	No treatment	227 59
	Patient education	163 42.3
Stage 3	Treat symptoms	122 31.7
	Mouth rinse	123 31.9
	Antibiotics	135 35.1
	Surgical debridement/resection	64 16.6
	No treatment	262 68.1
	Patient education	136 35.3
	Treat symptoms	92 23.9
	Mouth rinse	95 24.7
	Antibiotics	108 28.1
	Surgical debridement/resection	95 24.7

The correct answers are written in bold.

Table 3 presents the responses related to scenario questions. Dentists generally prefer to perform initial periodontal therapy and endodontic treatment if the patient has received oral BP for ≤ 3 years. Regarding surgical interventions, especially for impacted tooth

extraction and implant placement, the correct responses decreased for oral BP usage (Table 3). Participants chose the proper management for all treatment scenarios when patients received oral BPs regardless of duration. When the data for IV BP scenarios were analyzed, it was observed that participants preferred to refer the patient (Table 3).

To understand the impact of the duration of the profession, the dentists participating in the survey were divided into two groups: dentists working for less than ten years or more. When these two groups were compared, a statistically significant difference was found between the correct answers about all five treatment scenarios for patients receiving oral BP ≤ 3 years in favor of experienced dentists (Table 3, $P<.05$). In addition to this data, significant differences were observed in favor of experienced dentists' responses in patients receiving oral BPs >3 years for endodontic treatment and implant placement (Table 4, $P<.05$).

Table 2. Comparison of specialist and non-specialist dentists' approaches to BRONJ at all stages.

I can manage all stages of osteonecrosis.	General Dentist n (%)	Specialist n (%)	P
Yes	12 (4.2)	33 (33)	.000*
No	273 (95.8)	67 (67)	

*Continuity (Yates) Correction, * $P<.05$*

Table 3. Responses related to treatment scenario questions

		Performable n (%)	Non-performable n (%)	Consultation with medical professional n (%)	Performable after drug holiday n (%)	Referral to specialist n (%)
Initial periodontal treatment	Patient 1 Oral BP ≤ 3 year	149 (38.7)	96 (24.9)	82 (21.3)	13 (3.4)	45 (11.7)
	Patient 2 Oral BP >3 year	73 (19)	108 (28.1)	130 (33.8)	19 (4.9)	55 (14.3)
	Patient 3 IV BP ≤ 3 year	49 (12.7)	126 (32.7)	116 (30.1)	17 (4.4)	77 (20)
	Patient 4 IV BP ≤ 3 year	40 (10.4)	141 (36.6)	100 (26)	13 (3.4)	91 (23.6)
	Patient 1 Oral BP ≤ 3 year	194 (50.4)	1 (0.3)	62 (16.1)	7 (1.8)	121 (31.4)
	Patient 2 Oral BP >3 year	156 (40.5)	1 (0.3)	81 (21)	12 (3.1)	135 (35.1)
Endodontic treatment	Patient 3 IV BP ≤ 3 year	129 (33.5)	8 (2.1)	91 (23.6)	7 (1.8)	150 (39)
	Patient 4 IV BP >3 year	112 (29.1)	16 (4.2)	83 (21.6)	7 (1.8)	167 (43.4)
	Patient 1 Oral BP ≤ 3 year	96 (24.9)	104 (27)	107 (27.8)	24 (6.2)	54 (14)
	Patient 2 Oral BP >3 year	25 (6.5)	124 (32.2)	143 (37.1)	25 (6.5)	68 (17.7)
Tooth extraction	Patient 3 IV BP ≤ 3 year	11 (2.9)	137 (35.6)	121 (31.4)	24 (6.2)	92 (23.9)
	Patient 4 IV BP >3 year	8 (2.1)	154 (40)	104 (27)	14 (3.6)	105 (27.3)
Impacted tooth extraction	Patient 1 Oral BP ≤ 3 year	57 (14.8)	18 (4.7)	113 (29.4)	20 (5.2)	177 (46)
	Patient 2 Oral BP >3 year	10 (2.6)	27 (7)	130 (33.8)	25 (6.5)	193 (50.1)
	Patient 3 IV BP ≤ 3 year	3 (0.8)	50 (13)	108 (28.1)	19 (4.9)	205 (53.2)
	Patient 4 IV BP >3 year	6 (1.6)	65 (16.9)	98 (25.5)	10 (2.6)	206 (53.5)
Implant placement	Patient 1 Oral BP ≤ 3 year	55 (14.3)	37 (9.6)	170 (44.2)	17 (4.4)	106 (27.5)
	Patient 2 Oral BP >3 year	9 (2.3)	67 (17.4)	174 (45.2)	17 (4.4)	118 (30.6)
	Patient 3 IV BP ≤ 3 year	-	115 (29.9)	85 (22.1)	14 (3.6)	171 (44.4)
	Patient 4 IV BP >3 year	-	138 (35.8)	65 (16.9)	6 (1.6)	176 (45.7)

The correct answers are written in bold.

Table 4. Evaluation of different treatment plan scenarios according to the duration of the profession.

	Duration of profession	p	Performable	Non-performable	Consultation with medical professional	Performable after drug holiday	Referral to specialist
Periodontal treatment							
Oral, ≤3years	<10 years	¹ .008*	83 (36.1%)	64 (27.8%)	58 (25.2%)	5 (2.2%)	20 (8.7%)
	>10 years		66 (42.6%)	32 (20.6%)	24 (15.5%)	8 (5.2%)	25 (16.1%)
Oral, >3years	<10 years	.181	42 (18.3%)	66 (28.7%)	86 (37.4%)	9 (3.9%)	27 (11.7%)
	>10 years		31 (20%)	42 (27.1%)	44 (28.4%)	10 (6.5%)	28 (18.1%)
IV, ≤3years	<10 years	.339	27 (11.7%)	76 (33%)	77 (33.5%)	10 (4.3%)	40 (17.4%)
	>10 years		22 (14.2%)	50 (32.3%)	39 (25.2%)	7 (4.5%)	37 (23.9%)
IV, >3years	<10 years	.121	21 (9.1%)	84 (36.5%)	70 (30.4%)	7 (3%)	48 (20.9%)
	>10 years		19 (12.3%)	57 (36.8%)	30 (19.4%)	6 (3.9%)	43 (27.7%)
Endodontic treatment							
Oral, ≤3years	<10 years	² .014*	109 (47.4%)	1 (0.4%)	47 (20.4%)	2 (0.9%)	71 (30.9%)
	>10 years		85 (54.8%)	0 (0%)	15 (9.7%)	5 (3.2%)	50 (32.3%)
Oral, >3years	<10 years	² .003*	87 (37.8%)	0 (0%)	62 (27%)	5 (2.2%)	76 (33%)
	>10 years		69 (44.5%)	1 (0.6%)	19 (12.3%)	7 (4.5%)	59 (38.1%)
IV, ≤3years	<10 years	.683	76 (33%)	4 (1.7%)	60 (26.1%)	4 (1.7%)	86 (37.4%)
	>10 years		53 (34.2%)	4 (2.6%)	31 (20%)	3 (1.9%)	64 (41.3%)
IV, >3years	<10 years	.251	70 (30.4%)	7 (3%)	56 (24.3%)	4 (1.7%)	93 (40.4%)
	>10 years		42 (27.1%)	9 (5.8%)	27 (17.4%)	3 (1.9%)	74 (47.7%)
Simple tooth extraction							
Oral, ≤3years	<10 years	¹ .000*	46 (20%)	69 (30%)	80 (34.8%)	10 (4.3%)	25 (10.9%)
	>10 years		50 (32.3%)	35 (22.6%)	27 (17.4%)	14 (9%)	29 (18.7%)
Oral, >3years	<10 years	.135	12 (5.2%)	81 (35.2%)	90 (39.1%)	12 (5.2%)	35 (15.2%)
	>10 years		13 (8.4%)	43 (27.7%)	53 (34.2%)	13 (8.4%)	33 (21.3%)
IV, ≤3years	<10 years	.134	9 (3.9%)	86 (37.4%)	76 (33%)	12 (5.2%)	47 (20.4%)
	>10 years		2 (1.3%)	51 (32.9%)	45 (29%)	12 (7.7%)	45 (29%)
IV, >3years	<10 years	.096	5 (2.2%)	94 (40.9%)	71 (30.9%)	8 (3.5%)	52 (22.6%)
	>10 years		3 (1.9%)	60 (38.7%)	33 (21.3%)	6 (3.9%)	53 (34.2%)
Wisdom tooth extraction							
Oral, ≤3years	<10 years	¹ .006*	28 (12.2%)	12 (5.2%)	78 (33.9%)	6 (2.6%)	106 (46.1%)
	>10 years		29 (18.7%)	6 (3.9%)	35 (22.6%)	14 (9%)	71 (45.8%)
Oral, >3years	<10 years	¹ .277	6 (2.6%)	19 (8.3%)	85 (37%)	13 (5.7%)	107 (46.5%)
	>10 years		4 (2.6%)	8 (5.2%)	45 (29%)	12 (7.7%)	86 (55.5%)
IV, ≤3years	<10 years	¹ .212	3 (1.3%)	33 (14.3%)	70 (30.4%)	11 (4.8%)	113 (49.1%)
	>10 years		0 (0%)	17 (11%)	38 (24.5%)	8 (5.2%)	92 (59.4%)
IV, >3years	<10 years	² .173	6 (2.6%)	37 (16.1%)	64 (27.8%)	6 (2.6%)	117 (50.9%)
	>10 years		0 (0%)	28 (18.1%)	34 (21.9%)	4 (2.6%)	89 (57.4%)
Implant placement							
Oral, ≤3years	<10 years	¹ .023*	24 (15.5%)	13 (8.4%)	55 (35.5%)	8 (5.2%)	55 (35.5%)
	>10 years		7 (3%)	44 (19.1%)	117 (50.9%)	7 (3%)	55 (23.9%)
Oral, >3years	<10 years	¹ .002*	2 (1.3%)	23 (14.8%)	57 (36.8%)	10 (6.5%)	63 (40.6%)
	>10 years		-	68 (29.6%)	59 (25.7%)	10 (4.3%)	93 (40.4%)
IV, ≤3years	<10 years	¹ .104	-	47 (30.3%)	26 (16.8%)	4 (2.6%)	78 (50.3%)
	>10 years		-	85 (37%)	44 (19.1%)	3 (1.3%)	98 (42.6%)
IV, >3years	<10 years	² .331	-	53 (34.2%)	21 (13.5%)	3 (1.9%)	78 (50.3%)
	>10 years		-	-	-	-	-

¹ Chi-square test, ² Fisher Freeman Halton Test, * P < .05, the correct answers are written in bold.

DISCUSSION

Osteonecrosis is a challenging to treat clinical condition, and the optimum treatment strategy has yet to be determined; taking precautions before the situation occurs is paramount. Each case should always be evaluated individually with its characteristics to decide on the best patient-specific treatment approach. This cross-sectional study determines dentists' knowledge level and direction to the main dentistry treatments in patients under BP therapy. The main concern was whether the participating dentists knew of the published and accepted guidelines for treating and preventing MRONJ and estimated the need for relevant education.

To prepare questions related to treatment approaches considering MRONJ staging and scenario questions, AAOMS (2014) and American Dental Association recommendations were used.^{1,20} AAOMS 2014 guideline provides information related to the diagnosis, staging, and management strategies of MRONJ and highlights recent research.¹ On the other hand, American Dental Association's advisory statement includes information about managing the care of patients receiving anti-resorptive therapies.²⁰

As stated in the AAOMS 2014¹ report, no treatment is indicated for patients in the risk group, and these patients should only be educated. This survey revealed that the participants gave many correct responses for patients classified at risk (%70.1). Providing patient education and

follow-up ensures that the patient understands the importance of oral health to prevent potential osteonecrosis. On the other hand, 24.4% and 11.4% of participants stated that they would prescribe antibacterial mouthwash and antibiotics, respectively. However, the AAOMS paper and the guideline of the Turkish Dental Association emphasize that antibiotics are not required for at-risk patients. These results suggest that a few dentists participating in the survey did not adopt the philosophy of continuing education and need to be made aware of current guidelines for at-risk patients. An unnecessary antibiotic recommendation might create a social health problem.

When there is no clinical evidence of necrotic bone, non-specific clinical findings, and radiographic changes, the dental care professional should apply systemic management with pain medication and antibiotics when indicated (Stage 0). In this survey, 45.5% marked symptomatic treatment for Stage 0 patients and those who recommended antibiotics were 14%. Only one study evaluated participants' knowledge approach related to MRONJ stages, and comparable results were observed.¹⁷ In Alhussein et al.¹⁷'s study, 56% of the participants marked symptomatic treatment, whereas 15.5% selected antibiotic prescriptions for patients at Stage 0.¹⁷

The overall conclusion from the second part of the survey was that as the stage of osteonecrosis increased, it was observed that the number of dentists who selected the option of "I do not treat" gradually

increased (at risk (35.8%), Stage 0: (36.4%), Stage 1: (52.7%), Stage 2: (59%), Stage 3: (68.1%)). In addition, it was observed that the "I give patient education" choice was decreased (at risk: 70.1%, Stage 0: 61%, Stage 1: 47.3%, Stage 2: 42.3%, Stage 3: 35.1%). Furthermore, most participants would prefer to refer the patient to a specialist as the stage of osteonecrosis increases. It was observed that the selection of the correct treatment strategy was decreased when the clinical picture of osteonecrosis got complex. In a study among dentists in Sweden, 70% of the respondents did not know when to refer the patients to a specialist or treat them by themselves, considering the different clinical stages of MRONJ.¹⁹ These results suggest that most dentists feel unconfident about the treatment as the MRONJ staging increases. The lack of concise tools to assist decision-making or clinical experience should explain this attitude intention. Since many reports and guidelines have been published, the expectation is that MRONJ should be widely known among dentists and that preventive management should be performed precisely. Still, the results are different.^{17, 19}

Most of the dentists in the study gave more correct answers to the scenario questions for the patient who has been using oral BP ≤ 3 years. Alhussein et al.¹⁷ reported that participants more frequently gave wrong solutions for the scenarios of patients on oral BP > 3 years or IV BP, regardless of duration. In this study, although less than 50% of participants' answers were correct for the treatment scenarios considering oral BP usage of > 3 years and IV BP usage, most participants were hesitant to perform the procedure and were willing to refer the patient. This could be related to the participants' limited knowledge of the effect of extended duration of use.

Professional experience can give a point of view on the behavior and attitude of dentists.¹⁹ Therefore, in this study, while evaluating the scenario questions, dentists were divided into < 10 years and > 10 years according to the duration of their profession. Longer working experience predicts significantly better results for the scenario questions considering oral BP usage ≤ 3 years. Dentists < 10 years of occupation hesitated to perform initial periodontal therapy, endodontic treatment, simple and wisdom tooth extraction, and implant placement in patients who use BP ≤ 3 years. Similarly, Dahlgren & Wexell demonstrated that more ample working experience leads to a better assessment for the referral.¹⁹

No statistical significance was observed among the dental treatment approaches preferred for IV bisphosphonates patients. Dentists choose to refer or consult these patients to specialists, especially for complicated tooth extraction and implants, at rates of 50% or more. Similarly, in the study conducted by Alhussain et al.¹⁷, 63% of dentists referred these patients to a specialist.

Albu-Stan et al.²¹ evaluated dentists' awareness in Tîrgu Mureş regarding the dental treatments that can be applied to patients on BP therapy. One-hundred twenty questionnaires were returned. Of all respondents, 48 (40%) perform dental or surgical treatments on patients undergoing BP therapy, 68 (56.7%) do not perform dental or surgical treatments on these patients, and four of the respondents (3.3%) did not know the answer. One hundred (83.3%) respondents always contact the prescriber before surgery in these patients, regardless of how BPs are administered.

In the study of Gonzales et al.²², regardless of their knowledge about MRONJ and the duration of the profession, dentists avoid invasive procedures and refer patients to another physician.

Again, when evaluating the questionnaire study results related to BP and osteonecrosis, which Ahmadov et al.²³ applied only to general dentists, it was found that dentists had information about BP and MRONJ. Still, they needed to see themselves as competent in treating patients using BP. In addition, it has been observed that newly graduated dentists have more information on the subject.²³

A total of 129 general dental practitioners were surveyed regarding their awareness of MRONJ and its causes by Tanna et al.²⁴ 62% of the physicians correctly defined osteonecrosis as 'dead bone'. The remaining 38% either failed to respond or responded in the form of infection or delayed recovery. Considering whether general dentists have information about the risk of osteonecrosis with other antiresorptive and antiangiogenic drugs other than BP, it was reported that 55% were unaware of the other drugs. It was concluded that only 2% of dentists knew of antiresorptive denosumab. Participants were asked about performing a non-surgical extraction on an osteoporotic patient with no other systemic problems, only using oral alendronic acid for one year. 58% of dentists said they hesitated to intervene, and the most frequently cited reasons for the decision were a lack of clear protocol and reluctance to proceed without a second opinion.²⁴ As a result, it was stated that the knowledge of general dentists is vital in detecting potential osteonecrosis cases. To increase the primary care given to this cohort, there is a need for comprehensive guidelines to lead oral healthcare professionals in decision-making and undertaking treatment.²⁴

The possible limitation of this study is that there are no x-rays or detailed patient history of scenario questions. Another rule is that the participant can only select one option for each scenario. Thus, only the first approach of participants to osteonecrosis was evaluated. Secondly, only Turkish dentists were included in this study. Therefore, the conclusions drawn from this study should be limited to representing Türkiye rather than elsewhere in the dental community. The information gathered from this study has highlighted how dentists' approach and treat MRONJ patients and patients at risk of MRONJ and underlines the need for additional training or guidelines to ensure that patients receive the most appropriate and scientifically evidence-based treatment.

According to the American Dental Association's recommendations, all patients should receive regular dental examinations before or during the early phase of their BP treatment.²⁰ Also, all patients should be informed about oral BP usage, which places them at low risk of developing MRONJ. On the other hand, optimal oral health and hygiene practices will lower the risk of developing MRONJ.²⁵ Clinicians should never forget that the risk may be minimized but not eliminated.

Within the confines of this study, dentists' knowledge of BP and osteonecrosis due to these drugs is moderate. It has been found that specialist dentists' knowledge level is higher than general dentists. Dentists with less than ten years of working experience are more cautious about patients using BP due to the risk of developing osteonecrosis. When the dental treatment to be applied is a risk in the development of osteonecrosis, and the treatment approach to be used becomes difficult, the referral rate to a specialist dentist increases in direct proportion.

The reasons dentists refer patients who use BP to a specialist dentist should be investigated. Clinical guidelines about MRONJ should be discussed in detail and updated with new evidence-based information in continuous dental education activities such as courses, seminars, and national meetings.

Ethics Committee Approval: This study was approved by Istanbul University Cerrahpasa Medical Faculty Ethics Committee (Date: 17.08.2018, Number: 46007).

Informed Consent: Written informed consent was obtained from all participants.

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