

Investigation of Osteoradionecrosis Awareness of Dentists in Turkey in Patients with Head and Neck Cancer

Baş ve Boyun Kanseri Olan Hastalarda Türkiye'deki Diş Hekimlerinin Osteoradyonekroz Farkındalıklarının Araştırılması

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ABSTRACT

Introduction: Head and neck cancer encompasses cancers that develop in the oral cavity, salivary glands, paranasal sinuses, nasal cavity, larynx, pharynx, and upper neck nodules. The goal of treating these cancers is to eliminate the tumor while preserving the patient's quality of life and preventing potential complications. Radiotherapy, one of the treatment methods, can lead to undesirable changes in surrounding tissues. This study aims to investigate the awareness of dentists regarding osteoradionecrosis, a significant side effect of radiotherapy in patients with head and neck cancer.

Materials and Methods: In this survey study, dentists from 12 different regions in NUTS-1, as determined by TURKSTAT were contacted via digital media and their participation in the study was ensured. Participants were asked 16 questions related to osteoradionecrosis, prepared through a literature review. For the statistical analysis of the data collected from the questionnaires, frequency analysis, and chi-square tests were performed with the help of the SPSS 23 package program. A p-value<0.05 indicated statistical significance.

Results: A total of 634 participants, including 278 (44%) intern dentists, 149 (24%) general practitioner dentists, 128 (20%) doctoral-specialty students, and 79 (12%) specialist dentists, were included in the study. The analysis of the collected data from the study showed that doctoral specialty students and specialist dentists have more knowledge about the risk factors and diagnosis of osteoradionecrosis (p=0.000<0.050).

Conclusion: To enhance awareness of osteoradionecrosis among general and trainee dentists, it would be beneficial to increase educational content within undergraduate programs and to support this with continuous education activities.

Keywords: Awareness, Head and neck cancer, Osteoradionecrosis, Radiotherapy

Introduction

Cancers affecting the oral cavity, salivary glands, paranasal sinuses, nasal cavity, larynx, pharynx, and nodules in the upper neck collectively constitute head and neck cancer.¹ This type of cancer represents 5% of all cancer cases.² Factors such as genetic predisposition, poor oral hygiene, ill-fitting prostheses, malnutrition, chronic irritations, and certain viruses (such as Epstein-Barr virus (EBV)) contribute to the etiology of head and neck cancer, and smoking and alcohol consumption are significant risk factors. Although this form of cancer is predominantly observed in older individuals, it can also occur in children.³

The primary objectives in treating head and neck cancer are tumor eradication, preservation of the patient's quality of life, and prevention of potential complications. Surgical intervention, chemotherapy, and radiotherapy are commonly employed treatment modalities, either individually or in combination, depending on the patient's condition and the nature of the disease.⁴

Radiotherapy, as a treatment modality, can induce adverse changes in surrounding tissues.⁵ Osteoradionecrosis, characterized by exposed

ÖZ

Giriş: Baş ve boyun kanseri, ağız kavitesi, tükürük bezleri, paranasal sinüsler, burun boşluğu, larenks, farenks ve boyun üstündeki nodüllerde oluşan kanserleri kapsar. Bu kanserlerin tedavisinde, tümörü yok ederek hastanın yaşam kalitesini korumak ve olası komplikasyonları engellemek hedeflenir. Radyoterapi, bu tedavi yöntemlerinden biridir ancak çevre dokularda istenmeyen değişikliklere yol açabilir. Bu çalışmada, baş ve boyun kanseri olan hastalarda radyoterapinin önemli bir yan etkisi olan osteoradyonekroz konusunda diş hekimlerinin farkındalıklarının araştırılması amaçlanmıştır.

Materyal ve Metod: Bu anket çalışmasında, TÜİK tarafından belirlenen NUTS-1'e göre 12 farklı bölgedeki diş hekimleri, çalışmaya katılımlarını sağlamak için dijital ortamlar aracılığıyla iletişime geçildi. Katılımcılara literatür gözden geçirilerek hazırlanan osteoradyonekroz ile ilgili 16 soru soruldu. Anketlerden toplanan verilerin istatistiksel analizi için SPSS 23 yazılım paketi kullanılarak frekans analizi ve ki-kare testi yapıldı. p<0,05 değeri istatistiksel olarak anlamlı kabul edildi.

Bulgular: Çalışmaya toplam 634 katılımcı dahil edildi; bunlar 278 (%44) stajyer diş hekimi, 149 (%24) genel pratisyen diş hekimi, 128 (%20) doktora uzmanlık öğrencisi ve 79 (%12) uzman diş hekimi idi. Çalışmadan toplanan verilerin incelenmesi sonucunda, doktora uzmanlık öğrencilerinin ve uzman diş hekimlerinin osteoradyonekrozun risk faktörleri ve teşhisi konusunda daha fazla bilgiye sahip oldukları görülmüştür (p=0,000<0,050).

Sonuç: Pratisyen ve stajyer diş hekimlerinin osteoradyonekroz farkındalığını artırmak için lisans programları içindeki eğitimlerin biraz daha artırılması ve sürekli eğitim faaliyetleri aracılığıyla desteklenmesi faydalı olabilir.

Anahtar Kelimeler: Farkındalık, Baş ve boyun kanseri, Osteoradyonekroz, Radyoterapi

bone in a previously irradiated area persisting for more than 3 months without primary tumor, recurrence, or tumor-related metastasis, is a significant complication following radiotherapy for head and neck cancer patients.⁶

The incidence of osteoradionecrosis ranges from 5% to 15% and is most frequently observed within the first three years post treatment for head and neck cancers.⁷ Mandibular osteoradionecrosis is more prevalent than maxillary osteoradionecrosis involvement due to the relatively poor vascularization and dense structure of the mandibular bone.⁶

Osteoradionecrosis is a distinct pathology that shares a similar clinical appearance with medication-related osteonecrosis of the jaw (MRONJ). While MRONJ primarily develops due to antiresorptive or antiangiogenic drug therapies, osteoradionecrosis occurs following radiation therapy.⁸ These two conditions exhibit significant differences in terms of affected patient populations, clinical course, and treatment methods. Patient history and clinical examination remain the most sensitive diagnostic tools for accurately distinguishing between osteoradionecrosis and MRONJ.⁹

This study, which investigated the awareness of dentists in Turkey

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regarding osteoradionecrosis, a critical side effect of radiotherapy in head and neck cancer patients, holds particular significance because it represents the first comprehensive investigation addressing this topic in the literature, aiming to assess the knowledge level of dentists comprehensively.

Materials and Methods

The study, designed as a questionnaire-based survey, targeted dentists from 12 different regions classified by Nomenclature of Territorial Units for Statistics-1 (NUTS-1) according to Turkish Statistical Institute (TURKSTAT). Using digital media (e-mail), dentists were contacted, and their participation in the study was secured.

The selected regions included the Istanbul (TR-1), Balıkesir (TR-2), İzmir (TR-3), Bursa (TR-4), Ankara (TR-5), Konya (TR-5), Antalya (TR-6), Adana (TR-6), Kayseri (TR-7), Samsun (TR-8), Trabzon (TR-9), Erzurum (TR-A), Van (TR-B), and Gaziantep (TR-C) provinces, which were chosen because of their high population density. The study commenced in February 2023, and the data collection spanned 6 weeks.

On the first page of the questionnaire, participants were provided with information regarding the study's purpose, ethics committee approval, and the confidentiality of their data. It was explicitly stated that participation was voluntary. The questionnaire consisted of 16 questions regarding osteoradionecrosis, and was formulated after a thorough review of the literature. Following a section gathering demographic information such as participants' professional status (specialist dentist, doctoral-specialty student, general practitioner dentist, trainee dentist), gender, years of experience in the profession, specialty/doctorate branch, province, and institution, the questionnaire asked about the definition of osteoradionecrosis, its risk factors, diagnostic considerations, and other relevant aspects of physicians' knowledge. Statistical analysis of the data obtained from the questionnaires involved frequency analysis and the chi-square test, which were conducted using the SPSS 23 software package. A p-value of <0.05 was considered to indicate statistical significance.

Results

A total of 646 participants responded to the study. After analysing the data, 12 participants were excluded due to inconsistencies in their demographic information. Therefore, the final sample comprised 634 participants, including 278 (43.9%) intern dentists (5th-year dental students), 149 (23.5%) general practitioner dentists, 128 (20.2%) doctoral-specialty students, and 79 (12.4%) specialist dentists. Among these participants, 296 were male (47%) and 338 were female dentists. In terms of years of professional experience, 177 participants (27.9%) had been working for 1-5 years, 113 for 6-10 years, 41 (6.5%) for 11-20 years, 25 (3.9%) for more than 20 years, and 278 (43.9%) were intern dentists. Regarding specialty branches, 60 participants (9.5%) specialized in oral and maxillofacial surgery, 35 (5.5%) in oral and maxillofacial radiology, 18 (2.8%) in prosthodontics, 27 (4.3%) in periodontology, 21 (3.3%) in endodontics, 17 (2.7%) in pedodontics, 16 (2.5%) in restorative dentistry, 12 (1.9%) in orthodontics, and 428 (67.5%) had no specialty branch.

Among the participants, 442 (69.7%) originated from dental faculties, 44 (7.0%) from oral dental health centers, 30 (4.7%) from public hospitals, and 118 (18.6%) from private dental clinics. The distribution of NUTS-1 regions, the distribution was as follows: 79 (12.4%) from TR-1, 26 (4.1%) from TR-2, 55 (8.7%) from TR-3, 33 (5.2%) from TR-4, 134 (21.1%) from TR-5, 82 (12.9%) from TR-6, 52 (8.2%) from TR-7, 25 (3.9%) from TR-8, 32 (5.1%) from TR-9, 39 (6.2%) from TR-A, 34 (5.4%) from TR-B, and 43 (6.8%) from TR-C.

Questionnaire Items and Analysis:

Within the study's scope, participants were asked about the definition of osteoradionecrosis, with two options provided (see Table 1). The options were:

- It is a condition that occurs in patients using an antiangiogenic drug or bisphosphonate in the maxillofacial region for more than 8 weeks in patients without a history of radiotherapy.
- The condition of exposed bone that occurs without primary tumor, recurrence, or tumor-related metastasis and lasts for more than 3 months in a previously irradiated area.

Table 1. presents the responses of the participants.

Table 1. Distribution of Osteoradionecrosis Definition Choices. The chi-square analysis conducted to examine the relationship between participants' professional status and their choices of osteoradionecrosis definitions revealed a p-value less than 0.05, indicating a significant relationship. Accordingly, it appears that specialist dentists and doctoral-specialty students are more knowledgeable about the definition of osteoradionecrosis.

	Specialist dentists		Doctoral-specialty students		General practitioner dentists		Intern dentists		Total		p
Definition Option	n	%	n	%	n	%	n	%	n	%	
Option a	5	2.4	6	2.8	81	38.4	119	56.4	211	33.3	0.000
Option b	74	17.5	122	28.8	68	16.1	159	37.6	423	66.7	

Participants were asked specific questions regarding anamnesis from oncology patients to assess the risk of osteoradionecrosis, with three options provided (see Table 2). The options were:

- "Do you have a history of chemotherapy, which drug(s) have you used/are you using?"
- "Has radiotherapy been applied to any part of your body?"
- "Has radiotherapy been applied to your head and neck region?"

See Table 2 for the participants' responses to these questions.

Table 2. Anamnesis Questions and Risk Factors for Osteoradionecrosis. The chi-square analysis conducted to investigate the relationship between participants' professional status and their preferences for anamnesis questions regarding the risk of osteoradionecrosis in oncology patients revealed a p-value less than 0.05, indicating a significant relationship. Accordingly, it can be inferred that specialist dentists and doctoral students are more knowledgeable about anamnesis in this context.

	Specialist dentists		Doctoral-specialty students		General practitioner dentists		Intern dentists		Total		p
Anamnesis Question	n	%	n	%	n	%	n	%	n	%	
Option a	20	10.1	28	14.9	79	38.9	117	57.7	203	32	0.000
Option b	22	11.1	24	12.8	19	9.4	18	8.7	83	13.1	
Option c	37	18.7	74	39.3	68	33.6	117	56.1	348	54.9	

Regarding the distribution of participants' responses to the side effects of radiotherapy applied to the head and neck region, the results were as follows: oral mucositis, 592 (93.3%); decreased salivary secretion, 525 (82.8%); loss of taste, 417 (65.8%); dental caries, 330 (52.0%); osteoradionecrosis, 515 (81.2%); restricted mouth opening, 452 (71.3%); fungal infection, 151 (23.8%); and swallowing problems, 132 (20.8%).

Additionally, participants were queried about the risk factors for osteoradionecrosis, with eight factors presented for assessment. The response distributions are shown in Table 3.

Table 3. Response Distribution of Participants According to Osteoradionecrosis Risk Factors. According to the chi-square analysis conducted to determine the correlational differences in osteoradionecrosis risk factors between the study groups, a significant relationship was found in all factors except for gender, alcohol consumption, and poor oral hygiene, with p-values less than 0.05. Accordingly, it can be concluded that specialist dentists and doctoral students in the field generally possess greater knowledge about these risk factors.

		Specialist dentists		Doctoral- specialty students		General practitioner dentists		Intern dentists		Total		p
Osteoradionecrosis risk factors	Option	n	%	n	%	n	%	n	%	n	%	
Gender	Yes	22	12.6	44	25.2	30	17.1	79	45.1	175	27.6	0.074
	No	44	13.1	68	20.2	87	25.8	138	40.9	337	53.2	
	Don't know	13	10.7	16	13.1	32	26.2	61	50	122	19.2	
Tobacco use	Yes	54	13.5	97	24.3	96	24.1	152	38.1	399	62.9	0.005
	No	19	10.2	25	13.5	43	23.1	99	53.2	186	29.4	
	Don't know	6	12.2	6	12.2	10	20.4	27	55.2	49	7.7	
Alcohol consumption	Yes	47	14.5	73	22.5	67	20.7	137	42.3	324	51.2	0.234
	No	27	10.8	45	17.9	63	25.1	116	46.2	251	39.5	
	Don't know	5	8.5	10	16.9	19	32.2	25	42.4	59	9.3	
Older age	Yes	64	15.2	101	24	99	23.6	156	37.2	420	66.2	0.000
	No	13	9.1	18	12.7	37	26.1	74	52.1	142	22.4	
	Don't know	2	2.8	9	12.5	13	18	48	66.7	72	11.4	
Poor oral hygiene	Yes	73	13.2	111	20	137	24.7	233	42.1	554	87.4	0.104
	No	6	10	13	21.7	10	16.6	31	51.7	60	9.4	
	Don't know	0	0	4	10	2	20	14	70	20	3.2	
Wrong prosthesis use	Yes	57	15	96	25.1	91	23.9	137	36	381	60.1	0.000
	No	18	9.7	23	12.4	52	28	93	50	186	29.3	
	Don't know	4	6	9	13.4	6	9	48	71.6	67	10.6	
Radiation dose applications over 60 gy to the head and neck region	Yes	65	14.7	122	27.7	82	18.6	172	39	441	69.6	0.000
	No	6	5	4	3.3	42	35	68	56.7	120	18.9	
	Don't know	8	11	2	2.7	25	34.2	38	52.1	73	11.5	
Post radiation mucositis	Yes	64	16.2	102	25.9	80	20.3	148	37.6	394	62.2	0.000
	No	8	5.1	18	11.4	48	30.4	84	53.1	158	24.9	
	Don't know	7	8.5	8	9.8	21	25.6	46	59.1	82	12.9	

When considering the response distribution for the question regarding factors considered in the diagnosis of osteoradionecrosis, the results are as follows:

- Exposed bone tissue without mucosal healing (except for rare mandibular fractures after radiation) was noted by 561 participants (88.5%).
- Radiological findings of bone destruction were identified by 457 participants (72%).
- Previous radiotherapy to the head and neck region was reported by 430 participants (67.8%).
- The absence of tumor recurrence was mentioned by 118 participants (18.6%).
- Pathological findings of necrotic and sclerotic bone were recognized by 427 participants (67.3%).

Participants were also queried about their training and practices related to osteoradionecrosis diagnosis and management. The response distributions are shown in Table 4.

Table 4. Questions about Participants' Clinical Experience with Osteoradionecrosis. The chi-square analysis conducted found a significant relationship for all questions except for the question “Do you provide adequate information about osteoradionecrosis to patients with head and neck cancer?” since the p-value was not less than 0.05. Accordingly, it can be concluded that specialist dentists and doctoral students are generally more competent in the diagnosis of osteoradionecrosis.

		Specialist dentists		Doctoral-specialty students		General practitioner dentists		Intern dentists		Total		p
	Option	n	%	n	%	n	%	n	%	n	%	
Have you received adequate training on the diagnosis of osteoradionecrosis in patient examination?	Yes	45	31.5	60	42	23	16	15	10.5	143	22.5	0.000
	No	34	6.9	68	13.8	126	25.7	263	53.6	491	77.5	
Do you feel qualified to diagnose osteoradionecrosis?	Yes	50	32.7	63	41.1	20	13.1	20	13.1	153	24.1	0.000
	No	29	6	65	13.5	129	26.8	258	53.7	481	75.9	
Do you provide adequate information about osteoradionecrosis to patients with head and neck cancer?	Yes	61	11.5	106	19.9	133	25	232	43.6	532	83.9	0.115
	No	18	17.6	22	21.6	16	15.7	46	45.1	102	16.1	
Have you ever suspected osteoradionecrosis during patient examination?	Yes	42	33.3	54	42.9	17	13.5	13	10.3	126	19.9	0.000
	No	37	7.3	74	14.6	132	26	265	52.1	508	80.1	

For the question "Where did you receive education/training on the diagnosis and treatment of osteoradionecrosis?", the responses were as follows:

- Undergraduate education: 537 participants (84.7%)
- Doctorate specialty program: 112 participants (17.6%)
- Congresses and conferences: 149 participants (23.5%)
- Articles and journals: 132 participants (20.8%)
- Textbooks and subject books: 120 participants (18.9%).

Discussion

Osteoradionecrosis and MRONJ are two distinct pathologies that are quite similar in their clinical appearance.⁸ This study highlights a common issue among dental interns and general practitioners in Turkey, who frequently mistake osteoradionecrosis for MRONJ. Regarding the question regarding the definition of osteoradionecrosis, a significant portion of participants erroneously identified MRONJ as osteoradionecrosis. Specifically, 119 (56.4%) of the participants who selected the definition of MRONJ were interns, and 81 (38.4%) were general practitioners. Additionally, in relation to the first question, 117 (57.6%) trainees and 79 (38.9%) general practitioners were more inclined to inquire about chemotherapy history and specific medications during patient history taking.

Side effects stemming from radiotherapy, a common treatment modality for head and neck cancer, encompass a spectrum of complications detrimental to patients' quality of life. These include oral mucositis, decreased salivary secretion, loss of taste, dental caries, osteoradionecrosis, swallowing difficulties, fungal infections, and trismus.^{5,10} The findings of the study indicate that oral mucositis (592 participants, 93.3%), decreased salivary secretion (525 participants, 82.8%), and osteoradionecrosis (515 participants, 81.2%) were the most frequently reported side effects. Conversely, fungal infections (151 participants, 23.8%) and swallowing difficulties (132 participants, 20.8%) were less commonly cited. Measures aimed at mitigating the incidence and severity of these side effects are imperative to enhance patient well-being during radiotherapy.

Osteoradionecrosis is influenced by various risk factors, with radiotherapy to the head and neck region, particularly at doses exceeding 60 Gy, being the most significant.¹¹ Additionally, the risk of osteoradionecrosis increases notably when tooth extraction is performed within the initial four years after radiotherapy.¹² Other contributing factors include tobacco use, gender (males exhibiting higher susceptibility), alcohol consumption, advanced age, poor oral hygiene, post radiation mucositis, oral cancer, and ill-fitting prostheses.¹³⁻¹⁶ Examination of participants' responses reveals that risk factors beyond sex are more frequently acknowledged, with specialist dentists and doctoral students demonstrating greater awareness of this subject.

The diagnosis of osteoradionecrosis entails the consideration of several key factors:

1. History of previous radiotherapy to the head and neck region of the patient.
2. The presence of exposed bone tissue without concurrent healing of the mucosa, excluded rare instances of mandibular fractures after radiation.
3. Radiological evidence indicating bone destruction.
4. There was no of tumor recurrence in the affected area.
5. Pathological findings indicative of necrotic or sclerotic bone, characterized by empty osteocyte spaces, turbidity or fragmentation of bone trabeculae, loss of osteocytes and osteoblasts, and diminished vascularity in connective tissue.^{17,18}

According to the participants' responses, the presence of exposed bone tissue without concurrent healing of the mucosa was the most commonly acknowledged diagnostic factor for osteoradionecrosis (88.5%), whereas the absence of tumor recurrence was less frequently considered (18.6%). It is imperative to thoroughly evaluate these diagnostic factors to effectively distinguish osteoradionecrosis from conditions such as MRONJ.

In terms of knowledge level, the analysis revealed significant differences, with general practitioner dentists (25.7%) and trainee dentists (53.6%) reporting inadequate training in osteoradionecrosis diagnosis and not considering themselves competent. Conversely, specialist dentists and doctoral specialization students felt more competent. The high percentage (80.1%) of respondents who reported never having suspected osteoradionecrosis during patient examinations may be attributed to their inability to diagnose the condition. Participants' knowledge about osteoradionecrosis was generally limited (84.7%) to information provided during undergraduate programs.

According to many studies, it has been reported that the incidence of osteoradionecrosis decreases with good oral hygiene motivation and correct and rapid treatment methods applied by dentists.^{19,20} Procedures to medically prevent or minimize the progression of osteoradionecrosis will benefit the quality of life of patients and reduce the need for complicated surgeries in the future.²¹⁻²³ In this context, maintaining oral hygiene and prompt, effective dental treatment are important strategies to reduce the risk of osteoradionecrosis in patients undergoing cancer treatment.

The clinical significance of this study highlights the need to enhance awareness of osteoradionecrosis risk among patients undergoing treatment for head and neck cancer. The findings indicate that the level of knowledge among dentists regarding the risk factors and diagnosis of osteoradionecrosis varies according to their specialty training and experience. It is crucial for doctoral-specialty students and specialist dentists to have a more comprehensive understanding of this condition, as it is essential for its early diagnosis and management. However, the insufficient knowledge among general practitioners and dental interns could lead to suboptimal management and outcomes for patients, underscoring the importance of targeted education and training in this area.

This study has several limitations. Face-to-face question-and-answer sessions with dentists could have provided more reliable data; however, digital media was used to reach a broader sample representing dentists in Turkey. Furthermore, the participants were limited to individuals from a single country, which may affect the applicability of the results to other countries with different dental needs and publicly funded dental services. Additionally, the impact of the fields of study of specialist dentists and doctoral-specialty students on the study outcomes could not be fully assessed due to insufficient participation from certain specialties. Future research should address these limitations by including broader and more diverse samples to enhance the generalizability of the findings.

Conclusion

In cases involving the risk and development of osteoradionecrosis in patients with head and neck cancer, it would be advantageous for the treatment process to be overseen by specialist dentists and doctoral-specialty students. Furthermore, to enhance the awareness of osteoradionecrosis among general and trainee dentists, it would be beneficial to increase the educational content within undergraduate programs and to support this with continuous education activities.

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Etik Beyan / Ethical statement

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It is declared that during the preparation process of this study, scientific and ethical principles were followed and all the studies benefited are stated in the bibliography.

Benzerlik Taraması / Similarity scan

Yapıldı - ithenticate

Etik Bildirim / Ethical statement

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