Clinical and Experimental Health Sciences

Informed Consent in Dentomaxillofacial Radiology: A Cross-Sectional Study

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ABSTRACT

Objective: This study assessed the opinions and attitudes of dentomaxillofacial (DMF) radiology physicians worldwide about informed consent in terms of oral radiology applications.

Methods: DMF radiology physicians in various countries were invited to this study via e-mail. The participants answered their demographic information (gender, age, years of experience, title, institution, and country), and questions about informed consent. The Pearson chi-square and Fisher's exact tests were used for statistical analysis

Results: From 22 countries, 46 male (51.7%) and 43 female (48.3%) DMR radiology physicians completed the questionnaire. More than half of the participants (53.9%) were working in the university hospital, and the highest number of participants (32.6%) was from the European region. Most of the surveyors (70.8%) stated that consent is required in dental radiology. No statistically significant difference was found in the radiographic methods (intraoral, panoramic/extraoral, and cone-beam CT) applied in terms of obtaining consent ($p > 0.05$). While middle-aged physicians (30 –45 age) thought that patients should not be informed about the risk of radiation causing cancer, experienced participants (45 age and above) stated that information should be given about the cancer risk ($p < 0.05$).

Conclusion: The results of this study showed that most of the DMF radiology physicians stated that they have responsibility for getting informed consent and only one-third of the participants inform patients about the risks of radiation.

Keywords: Dental radiology, informed consent, ethics

1. INTRODUCTION

Physicians are responsible for providing all information about the risks, benefits and alternative methods of diagnosis and treatment procedures to be applied to patients (1). Informed consent is the provision of sufficient information to a patient to make consciously a choice, the physician to inform the patient about the risks and alternative treatments, and the patient's approval or rejection of the medical intervention to be applied because of this information (1-3).

Radiographic procedures have an important place in diagnosis and treatment planning in dental practice. The widespread of medical imaging and the trend of overuse with unnecessary reviews that do not provide any health benefits seem to confirm the hypothesis that radiological research is widely trivialized (4). Legal and ethically valid patient consent is required before any patient intervention, including diagnostic radiographic procedures (5). In terms of radiation dose, risks in dentomaxillofacial (DMF) imaging applications are generally lower than in medical applications (6). However, patients should be informed about radiology practices in dentistry. They should be provided with information about why the radiographic examination is required, which techniques can be used, the benefits, risks, duration, and cost of the technique (3,7). In addition to conventional dental imaging such as intraoral and panoramic radiography, the patient's hesitation increases in cone-beam CT applications, which have recently become widespread and whose radiation dose is higher than conventional imaging. The dentists should explain to the patient that there is a procedure that will provide much more benefit than the minimal biological risk associated with the procedure to be performed (8).

To the best of our knowledge, there are published one study evaluating the perceptions and attitudes of DMF radiologists in Turkey about informed consent (7). This study evaluates the opinions and attitudes of DMF radiology physicians worldwide about informed consent in terms of oral radiology applications.

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2. METHODS

This study protocol was conducted with the principles of the Helsinki Declaration. Before the research, ethical approval was received from Pamukkale University Ethics Committee (No: 60116787-020/37899, Date of approval: 25/06/2020).

2.1. Participants

DMF radiology physicians [research assistants (postgraduate education, Ph.D., or specialty education, etc.), specialists, and lecturers (professor, associate professor, assistant professor)] in various countries were invited to the study via e-mail. A link to the online survey website (Google Forms; Alphabet Co., Mountain View, CA) where the questions were prepared was sent to the surveyors. Participation in the survey was voluntary. The surveyors completed their demographic information (gender, age, years of experience, title, institution, and country), and answered questions about informed consent.

2.2. Survey

The questionnaire in this study consisted of the first part with demographic data and the second part with 10 questions about informed consent. The studies by Kurt et al. (9), Karsli et al. (10), and Akay et al. (7) were used in the preparation of the survey questions. Questions about informed consent and answer options are given in Table 1.

Table 1. *Questions and answers directed to the participants*

Question no	Question	Answer no	Answer
1	How would you evaluate your knowledge on informed consent?	a	Sufficient
		b	Partially sufficient
		c	Insufficient
2	Is it necessary to obtain informed consent from patients at the dental radiology clinic?	a	Yes
		b	No
		c	Not sure/No idea
3	How do you think informed consent should be?	a	Written (signed by patient and physician)
		b	Verbal
		c	Verbal and written
4	Do you get informed consent from your patients before dental radiography at your institution?	a	Yes
		b	No
5	#+ In which radiographic methods do you get patient consent?	a	Intraoral imaging
		b	Panoramic/Extraoral imaging
		c	Cone-beam CT
6	# Whom are these informed consent forms given to or explained the patients?	a	Dentomaxillofacial radiologist
		b	Radiology technician
		c	Secretariat/Physician assistant
7	Do you think that every patient or their relatives should be informed about the risk of cancer caused by radiation?	a	Yes
		b	No
		c	Not sure/No idea
8	Are patients or patients' relatives informed about radiation before the procedure in your radiology department?	a	Yes
		b	No
		c	Not sure
9	Who should provide information about the risk of cancer caused by radiation?	a	Radiology department staff
		b	The referring physician
10	Do you think dentomaxillofacial radiologists have the responsibility for getting informed consent?	a	Yes
		b	No
		c	Not sure/No idea

 # Answered by the participants who stated that informed consent was obtained from the patients before dental radiography.
+ Participants have marked more than one option

2.3. Statistical Analysis

As a result of the power analysis performed by considering the answer categories of the questionnaire questions and the descriptive characteristics of the participants, the sample size was determined as 89 for the medium effect size and the significance level of 0.05, and the statistical power of 90%. The measurement reliability of the questionnaire was evaluated with Cronbach's alpha coefficient and the survey was reported as reliable (Cronbach's alpha = 0.71). The Pearson chi-square and Fisher's exact tests were used for data analysis. For analysis, SPSS (IBM Corp.; New York, NY) was used, and the statistical significance level was determined as $p < 0.05$.

3. RESULTS

From 22 countries, 46 male (51.7%) and 43 female (48.3%) dentists completed the survey. Most of the participants (46.1%) were in the 31-45 age range, while 36.0% of DMF radiology physicians had lower experience (1-8 years). Most of the physicians (70.8%) were DMF radiology specialists. While more than half of the participants (53.9%) were working in the university hospital, the highest number of participants (32.6%) was from the European region. Twenty-seven (30.3%) of DMF radiologists from South America, eleven (12.4%) from the Far East and ten (11.2%) from North America participated in the survey.

Most of the surveyors (70.8%) stated that obtaining informed consent from the patient is necessary at the dental radiology clinic. A significant portion of the participants (41.6%) stated that they did not obtain informed consent before dental radiography procedures in their clinics. The percentage of informed consent for cone-beam CT was higher than for conventional imaging methods. Half of the participants (49.4%) stated that patients should be informed about the cancer risk due to radiation. Details of the answers for the surveyors are shown in Table 2 (Subtitle of 'total participants').

Comparison of views on informed consent by gender, title, and institution are shown in Table 2. Male surveyors thought that the consent should be written while females stated that forms should be both verbal and written ($p > 0.05$). The effect of title on the opinions of radiologists about informed consent was found statistically insignificant ($p > 0.05$). Most of the surveyors (55.5%) from the private institutions stated that informed consent forms were given by secretariat/physician assistants. However, radiologists from the university hospital reported that informed consent forms were given by DMF radiologists (39.3%) and radiology technicians (35.7%) mostly ($p < 0.05$).

Table 3 shows the comparison of views by age, and experience. Most radiologists aged between 30 and 45 (43.9%) felt that patients shouldn't be informed about the risk of cancer. Otherwise, most radiologists aged 45 and above (67.5%) felt that patients should be informed about the risk of cancer ($p < 0.05$). The surveyors who have experienced 1-8 years and 9-20 years had similar opinions about the evaluation of their knowledge, sufficient (approx. 50.0%) and partly sufficient (approx. 50.0%). However, the fact that most of the radiologists with 21 years or more experience (86.2%) thought that their knowledge about informed consent was sufficient gave a statistically significant result ($p < 0.05$). Most of the radiologists who have experienced 1-8 years (72.7%), said that informed consent forms were given by secretariat/physician assistants. However, radiologists who have experienced 21 years and above reported that informed consent forms were given by DMF radiologists (38.9%) and radiology technicians (44.4%) mostly ($p < 0.05$).

While the South Americans radiologists stated that the written consent form would be sufficient, the Europeans and Far Easterners stated that it should be both written and verbal. Details are shown in Table 4.

Table 2. *Comparison of views on informed consent by gender, title, and institution*

		Gender			Title				Institution				
Item	Answer	Female	Male	p-value	Research assistant	Specialist	Lecturer	p-value	Private	State hospital	University hospital	p-value	Total participants
1	a	27 (62.8%)	27 (58.7%)	0.693	5 (50.0%)	39 (61.9%)	10 (62.5%)	0.763	14 (58.3%)	9 (52.9%)	31 (64.6%)	0.674	**54 (60.7%)**
	b	14 (32.6%)	18 (39.1%)		5 (50.0%)	22 (34.9%)	5 (31.3%)		9 (37.5%)	8 (47.1%)	15 (31.3%)		**32 (35.9%)**
	c	2 (4.7%)	1 (2.2%)		0 (0.0%)	2 (3.2%)	1 (6.3%)		1 (4.2%)	0 (0.0%)	2 (4.2%)		**3 (3.4%)**
2	a	32 (74.4%)	31 (67.4%)	0.473	6 (60.0%)	47 (74.6%)	10 (62.5%)	0.464	17 (70.8%)	13 (76.5%)	33 (68.8%)	0.834	**63 (70.8%)**
	b	6 (14.0%)	11 (23.9%)		2 (20.0%)	13 (20.6%)	2 (12.5%)		6 (25.0%)	3 (17.6%)	8 (16.7%)		**17 (19.1%)**
	c	5 (11.6%)	4 (8.7%)		2 (20.0%)	3 (4.8%)	4 (25.0%)		1 (4.2%)	1 (5.9%)	7 (14.6%)		**9 (10.1%)**
3	a	22 (51.2%)	15 (32.6%)	**0.023***	3 (30.0%)	25 (39.7%)	9 (56.3%)	0.356	9 (37.5%)	7 (41.2%)	21 (43.8%)	0.879	**37 (41.6%)**
	b	0 (0.0%)	6 (13.0%)		1 (10.0%)	5 (7.9%)	0 (0.0%)		1 (4.2%)	0 (0.0%)	5 (10.4%)		**6 (6.7%)**
	c	21 (48.8%)	25 (54.3%)		6 (60.0%)	33 (52.4%)	7 (43.8%)		14 (58.3%)	10 (58.8%)	22 (45.8%)		**46 (51.7%)**
4	a	26 (60.5%)	26 (56.5%)	0.830[a]	4 (40.0%)	36 (57.1%)	12 (75.0%)	0.197	13 (54.2%)	9 (52.9%)	30 (62.5%)	0.698	**52 (58.4%)**
	b	17 (39.5%)	20 (43.5%)		6 (60.0%)	27 (42.9%)	4 (25.0%)		11 (45.8%)	8 (47.1%)	18 (37.5%)		**37 (41.6%)**
5	a	17 (65.4%)	21 (80.8%)	0.669	4 (100.0%)	24 (66.7%)	10 (83.3%)	0.280	9 (69.2%)	6 (66.6%)	23 (76.7%)	0.554	**38 (29.2%)**
	b	19 (73.1%)	22 (84.6%)	0.832	4 (100.0%)	27 (75.0%)	10 (83.3%)	0.342	10 (76.9%)	8 (88.9%)	23 (76.7%)	0.878	**41 (31.6%)**
	c	25 (96.2%)	26 (100.0%)	0.999	4 (100.0%)	35 (97.2%)	12 (100.0%)	0.187	13 (100.0%)	8 (88.9%)	30 (100.0%)	0.508	**51 (39.2%)**
6	a	6 (30.0%)	6 (30.0%)	0.838	0 (0.0%)	7 (25.0%)	5 (50.0%)	0.251	1 (11.1%)	0 (0.0%)	11 (39.3%)	**0.007***	**12 (30.0%)**
	b	5 (25.0%)	8 (40.0%)		2 (100.0%)	8 (28.6%)	3 (30.0%)		3 (33.3%)	0 (0.0%)	10 (35.7%)		**13 (32.5%)**
	c	9 (45.0%)	6 (30.0%)		0 (0.0%)	13 (46.4%)	2 (20.0%)		5 (55.5%)	3(100.0%)	7 (25.0%)		**15 (37.5%)**
7	a	25 (58.1%)	19 (41.3%)	0.141	6 (60.0%)	27 (42.9%)	11 (68.8%)	0.141	7 (29.2%)	8 (47.1%)	29 (60.4%)	0.120	**44 (49.4%)**
	b	11 (25.6%)	21 (45.7%)		2 (20.0%)	25 (39.7%)	5 (31.3%)		11 (45.8%)	6 (35.3%)	15 (31.3%)		**32 (36.0%)**
	c	7 (16.3%)	6 (13.0%)		2 (20.0%)	11 (17.5%)	0 (0.0%)		6 (25.0%)	3 (17.6%)	4 (8.3%)		**13 (14.1%)**
8	a	16 (37.2%)	16 (34.8%)	0.194	4 (40.0%)	19 (30.2%)	9 (56.3%)	0.146	6 (25.0%)	4 (23.5%)	22 (45.8%)	0.272	**32 (36.0%)**
	b	18 (41.9%)	26 (56.5%)		4 (40.0%)	33 (52.4%)	7 (43.8%)		14 (58.3%)	9 (52.9%)	21 (43.8%)		**44 (49.4%)**
	c	9 (20.9%)	4 (8.7%)		2 (20.0%)	11 (17.5%)	0 (0.0%)		4 (16.7%)	4 (23.5%)	5 (10.4%)		**13 (14.1%)**
9	a	27 (62.8%)	30 (65.2%)	0.829[a]	6 (60.0%)	41 (65.1%)	10 (62.5%)	0.943	16 (66.7%)	7 (41.2%)	34 (70.8%)	0.087	**57 (64.0%)**
	b	16 (37.2%)	16 (34.8%)		4 (40.0%)	22 (34.9%)	6 (37.5%)		8 (33.3%)	10 (58.8%)	14 (29.2%)		**32 (36.0%)**
10	a	28 (65.1%)	24 (52.2%)	0.454	5 (50.0%)	36 (57.1%)	11 (68.8%)	0.595	12 (50.0%)	13 (76.5%)	27 (56.3%)	0.215	**52 (58.4%)**
	b	9 (20.9%)	14 (30.4%)		3 (30.0%)	17 (27.0%)	3 (18.8%)		7 (29.2%)	2 (11.8%)	14 (29.2%)		**23 (25.9%)**
	c	6 (14.0%)	8 (17.4%)		2 (20.0%)	10 (15.9%)	2 (12.5%)		5 (20.8%)	2 (11.8%)	7 (14.6%)		**14 (15.7%)**

*Pearson's chi-square test, a: Fisher's Exact test, *: significant at the 0.05 level. Details of the questions and answers are given in Table 1.*

Table 3. *Comparison of views on informed consent by age and experience*

		Age				Experience (years)			
Item	**Answer**	**22-30**	**30-45**	**45 and above**	**p-value**	**1-8**	**9-20**	**21 and above**	**p-value**
1	**a**	3 (37.5%)	23 (56.1%)	28 (70.0%)	0.339	16 (50.0%)	13 (46.4%)	25 (86.2%)	**0.014***
	b	5 (62.5%)	16 (39.0%)	11 (27.5%)		15 (46.9%)	14 (50.0%)	3 (10.3%)	
	c	0 (0.0%)	2 (4.9%)	1 (2.5%)		1 (3.1%)	1 (3.6%)	1 (3.4%)	
2	**a**	4 (50.0%)	31 (75.6%)	28 (70.0%)	0.338	24 (75.0%)	19 (67.9%)	20 (69.0%)	0.889
	b	3 (37.5%)	7 (17.1%)	7 (17.5%)		6 (18.8%)	6 (21.4%)	5 (17.2%)	
	c	1 (12.5%)	3 (7.3%)	5 (12.5%)		2 (6.3%)	3 (10.7%)	4 (13.8%)	
3	**a**	3 (37.5%)	18 (43.9%)	16 (40.0%)	0.237	15 (46.9%)	11 (39.3%)	11 (37.9%)	0.081
	b	1 (12.5%)	0 (0.0%)	5 (12.5%)		1 (3.1%)	0 (0.0%)	5 (17.2%)	
	c	4 (50.0%)	23 (56.1%)	19 (47.5%)		16 (50.0%)	17 (60.7%)	13 (44.8%)	
4	**a**	5 (62.5%)	22 (53.7%)	25 (62.5%)	0.701	19 (59.4%)	13 (46.4%)	20 (69.0%)	0.223
	b	3 (37.5%)	19 (46.3%)	15 (37.5%)		13 (40.6%)	15 (53.6%)	9 (31.0%)	
5	**a**	3 (60.0%)	14 (63.6%)	21 (84.0%)	0.236	11 (57.9%)	11 (84.6%)	16 (80.0%)	0.236
	b	3 (60.0%)	17 (77.3%)	21 (84.0%)	0.535	13 (68.4%)	12 (92.3%)	16 (80.0%)	0.481
	c	5 (100.0%)	21 (95.5%)	25 (100.0%)	0.563	18 (94.7%)	13 (100.0%)	20 (100.0%)	0.225
6	**a**	0 (0.0%)	3 (18.8%)	9 (40.9%)	**0.019***	1 (9.1%)	4 (36.4%)	7 (38.9%)	**0.040***
	b	1 (50%)	3 (18.8%)	9 (40.9%)		2 (18.2%)	3 (27.3%)	8 (44.4%)	
	c	1 (50%)	10 (62.5%)	4 (18.2%)		8 (72.7%)	4 (36.4%)	3 (16.7%)	
7	**a**	4 (50.0%)	13 (31.7%)	27 (67.5%)	**0.011***	17 (53.1%)	11 (39.3%)	16 (55.2%)	0.467
	b	4 (50.0%)	18 (43.9%)	10 (25.0%)		9 (28.1%)	12 (42.9%)	11 (37.9%)	
	c	0 (0.0%)	10 (24.4%)	3 (7.5%)		6 (18.8%)	5 (17.9%)	2 (6.9%)	
8	**a**	3 (37.5%)	11 (26.8%)	18 (45.0%)	0.155	13 (40.6%)	5 (17.9%)	14 (48.3%)	0.172
	b	4 (50.0%)	26 (63.4%)	14 (35.0%)		14 (43.8%)	18 (64.3%)	12 (41.4%)	
	c	1 (12.5%)	4 (9.8%)	8 (20.0%)		5 (15.6%)	5 (17.9%)	3 (10.3%)	
9	**a**	3 (37.5%)	28 (68.3%)	26 (65.0%)	0.248	22 (68.8%)	16 (57.1%)	19 (65.5%)	0.633
	b	5 (62.5%)	13 (31.7%)	14 (35.0%)		10 (31.3%)	12 (42.9%)	10 (34.5%)	
10	**a**	4 (50.0%)	25 (61.0%)	23 (57.5%)	0.296	21 (65.6%)	15 (53.6%)	16 (55.2%)	0.262
	b	1 (12.5%)	9 (22.0%)	13 (32.5%)		4 (12.5%)	9 (32.1%)	10 (34.5%)	
	c	3 (37.5%)	7 (17.1%)	4 (10.0%)		7 (21.9%)	4 (14.3%)	3 (10.3%)	

*Pearson's chi-square test, a: Fisher's Exact test, *: significant at the 0.05 level. Details of the questions and answers are given in Table 1.*

Table 4. *Comparison of views on informed consent by region*

		Region						
Item	**Answer**	**Europe**	**Middle East**	**Far East**	**South America**	**North America**	**Others**	**p-value**
1	**a**	12 (41.4%)	6(100.0%)	9 (81.8%)	16 (59.3%)	7 (70.0%)	4 (66.7%)	0.081
	b	17 (58.6%)	0 (0.0%)	2 (18.2%)	9 (33.3%)	2 (20.0%)	2 (33.3%)	
	c	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (7.4%)	1 (10.0%)	0 (0.0%)	
2	**a**	22 (75.9%)	5 (83.3%)	7 (63.6%)	14 (51.9%)	9 (90.0%)	6 (100.0%)	0.326
	b	5 (17.2%)	1 (16.7%)	3 (27.3%)	8 (29.6%)	0 (0.0%)	0 (0.0%)	
	c	2 (6.9%)	0 (0.0%)	1 (9.1%)	5 (18.5%)	1 (10.0%)	0 (0.0%)	
3	**a**	13 (44.8%)	3 (50.0%)	1 (%9.1)	16 (59.3%)	4 (40.0%)	0 (0.0%)	**0.001***
	b	2 (6.9%)	0 (0.0%)	4 (%36.4)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	c	14 (48.3%)	3 (50.0%)	6 (%54.5)	11 (40.7%)	6 (60.0%)	6 (100%)	
4	**a**	16 (55.2%)	4 (66.7%)	5 (45.5%)	15 (55.6%)	7 (70.0%)	5 (83.3%)	0.664
	b	13 (44.8%)	2 (33.3%)	6 (54.5%)	12 (44.4%)	3 (30.0%)	1 (16.7%)	
5	**a**	10 (62.5%)	1 (25.0%)	5 (100.0%)	15 (100.0%)	4 (57.1%)	3 (60.0%)	0.482
	b	12(75.0%)	1 (25.0%)	5 (100.0%)	15 (100.0%)	4 (57.1%)	4 (80.0%)	0.480
	c	15 (93.8%)	4(100.0%)	5 (100.0%)	15 (100.0%)	7 (100.0%)	5 (100.0%)	0.613
6	**a**	2 (50.0%)	2(50.0%)	3 (60.0%)	3 (20.0%)	1 (14.3%)	1 (20.0%)	0.450
	b	1 (25.0%)	2 (50.0%)	2 (40.0%)	4 (26.7%)	2 (28.6%)	2 (40.0%)	
	c	1 (25.0%)	0 (0.0%)	0 (0.0%)	8 (53.3%)	4 (57.1%)	2 (40.0%)	
7	**a**	12 (41.4%)	1 (16.7%)	4 (36.4%)	18 (66.7%)	6 (60.0%)	3 (50.0%)	0.132
	b	10 (34.5%)	4 (66.7%)	7 (63.6%)	7 (25.9%)	3 (30.0%)	1 (16.7%)	
	c	7 (24.1%)	1 (16.7%)	0 (0.0%)	2 (7.4%)	1 (10.0%)	2 (33.3%)	
8	**a**	9 (31.0%)	3 (50.0%)	6 (54.5%)	9 (33.3%)	4 (40.0%)	1 (16.7%)	0.699
	b	16 (55.2%)	2 (33.3%)	5 (45.5%)	14 (51.9%)	3 (30.0%)	4 (66.7%)	
	c	4 (13.8%)	1 (16.7%)	0 (0.0%)	4 (14.8%)	3 (30.0%)	1 (16.7%)	
9	**a**	19 (65.5%)	4 (66.7%)	5 (45.5%)	15 (55.6%)	10 (100.0%)	4 (66.7%)	0.147
	b	10 (34.5%)	2 (33.3%)	6 (54.5%)	12 (44.4%)	0 (0.0%)	2 (33.3%)	
10	**a**	16 (55.2%)	4 (66.7%)	3 (27.3%)	17 (63.0%)	6 (60.0%)	6 (100.0%)	0.122
	b	5 (17.2%)	2 (33.3%)	6 (54.5%)	7 (25.9%)	3 (30.0%)	0 (0.0%)	
	c	8 (27.6%)	0 (0.0%)	2 (18.2%)	3 (11.1%)	1 (10.0%)	0 (0.0%)	

*Pearson's chi-square test, *: significant at the 0.05 level. Details of the questions and answers are given in Table 1.*

4. DISCUSSION

For a patient referred for radiological imaging, obligations such as non-maleficence and the benefits of the procedure occur. While acknowledging that ionizing radiation can cause harm, it should provide diagnostic benefits to the patient (11). The risk of dental imaging is lower than medical imaging (6). However, information should be given to patients about radiological applications. Furthermore, with active information, patients also provide the authority to oversee their health care (12). There is no obvious consensus on whether to obtain informed consent or which consent should be obtained from patients exposed to ionizing radiation during radiological examinations (4). The failure to obtain proper informed consent is medical malpractice. This process should provide enough complete information to allow the patient to understand the consequences of the decision and to allow the patient to make an informed decision (1). In this context, it should be presented to patient information about why the application of imaging is necessary, which techniques can be used, the benefits, risks, cost, and duration of the techniques. Consent is an effective and mutual communication method between the patient and the physicians. Both verbal and written consent accepted express consent forms (13). It is a general legal and ethical principle to obtain valid consent before starting a treatment or physically examining a patient or conducting research involving human participants (2). Lee et al. (14) reported that only 7% of the patients were informed about the risks of computed tomography scans. The main purpose of the current study was to obtain the opinions of DMF radiologists in dental radiology practices regarding informed consent. In this study, 70.8% of the participants were required informed consent in dental radiological procedures, while 19.1% of the participants stated that it was not necessary.

To inform the patient, the dentist must accurately explain to the patient the diagnosis of the problem, the proposed way of treating or managing it with other probable approaches (including no management), and the risks/benefits (8). Radiographic examinations should be performed after reviewing the patients' medical and dental histories and a detailed clinical examination. There is a justification principle in the choice of radiographic method. Radiography is performed when the expected diagnostic benefit outweighs the biological risk of exposure to ionizing radiation (8). In Europe, the Euratom law emphasizes the necessity to justify the need for a radiological examination before a patient is referred to a radiologist (12).

In radiology practice, obtaining mandatory written informed consent from patients in every medical imaging procedure (using ionizing radiation) may cause some problems. These problems are the following; unnecessary anxiety in patients especially after being informed, the refusal of patients to radiological procedures required for individuals (12). There is often a limited patient-physician (radiologist) relationship in radiology clinics (15). Semelka et al. (12) argue that informed consent should be required for procedures with higher radiation exposure. They suggested the necessity of this approval for procedures containing high dose radiation, especially those containing 1 mSv and above, such as CT, positron emission tomography, and fluoroscopy (12). In the literature, the application of "informed consent" in dental radiology procedures can be considered "implied consent" has been reported. It is argued that the patient's obligation to inform is not lifted with implied consent, but in interventions involving low risks, the illumination can be too narrow or even neglected (3). The results of this study showed that a significant portion of the participants (41.6%) did not obtain informed consent before dental radiography procedures in their clinics. Approximately one-quarter of the DMF radiology specialists reported that they obtained consent from patients before intraoral radiography applications, 31.6% before panoramic radiography/extraoral radiography procedures, and 39.2% before cone-beam CT scans.

It is the responsibility of physicians to provide all information about the risks, benefits, and alternatives of applications to be made in the decision-making process of patients (1). Previous studies showed that the awareness of physicians is insufficient for the doses and risks of radiation (16). In a study about informing the patients about the risks and benefits of radiological examinations, the authors reported that physicians requesting radiography did not have sufficient information about the radiation dose (15). Written or verbal information given to the patient may vary depending and the dose and the risk (12). In a previous study, Wright (6) emphasized the requirement for the physician requesting radiography to explain the risks of radiation doses in panoramic radiography and cone-beam CT examinations, as well as the necessity to inform the patient about the radiologic risks for the physicians who keep cone-beam CT or panoramic radiographs in their facilities.

To the best of our knowledge, there is a published study evaluating the knowledge and awareness of DMF radiologists regarding informed consent in dental radiology practices. In the study conducted in Turkey, it was reported that most participants did not inform patients about radiation (7). In radiography implementations, three different professional roles are usually played by the physician who makes the request, the radiologist, and the radiology technician. Considering the involvement of both referring physicians and radiology staff (radiologists and technicians) in the medical imaging procedure, the question arises of who should explain the risk of ionizing radiation (11). However, it has been reported that the informed consent process for medical imaging examinations containing ionizing radiation should start with the referring physician and that explanation support should be provided by the radiologist (17). In our study, while most participants (64.0%) stated that the radiology personnel should provide information to the patient about the radiation risk, 36.0% of the participants reported that referring physicians should make an explanation.

Consent is an effective and mutual communication method between the patient and the physician (13). Three methods are generally used to obtain consent from patients: implied consent, verbal consent, written consent (2,3). Both verbal and written consent is express consent forms (13). Generally, obtaining written informed consent applies to all invasive procedures and all applications that fall within the patient's physical space. The most common applications of obtaining written consent in radiology are mostly before interventional radiology procedures (12). The fact that the informed consent form was signed by both the physician and the patient does not indicate that the physician alone fulfills the ethical/legal responsibilities (9). In our study, approximately half of the participants (51.7%) stated that the informed consent form should be in a written (signed by patient and physician) form from the patients, and 41.6% of them said that it should be both written and verbal.

5. CONCLUSIONS

The results of this study showed that most of the DMF radiology physicians said that they have responsibility for getting informed consent. However, a significant portion of the participants stated that they did not obtain informed consent before dental radiography procedures in their clinics. It was found that only one-third of the participants inform patients about the radiation risks. Further studies can be conducted to compare the views and attitudes of DMF radiologists and medical radiologists by increasing the sample size regarding informed consent in radiology. In addition, the results of this study showed that it is necessary to focus on continuing education on this subject.

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