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Elif Sadik

Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Ordu University, Ordu, Turkey,
elifsadik@odu.edu.tr

Ceren Gökmenoğlu

Department of Periodontology, Faculty of Dentistry, Ordu University, Ordu, Turkey,
erdoganceren@yahoo.com

Cankat Kara

Department of Periodontology, Faculty of Dentistry, Ordu University, Ordu, Turkey, mcankat@hotmail.com

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ORIGINAL ARTICLE

Complete Edentulism of Dental Patients in Northeastern Turkey: Prevalence and Radiographic Findings on Panoramic Radiographs

Elif Sadik¹, Ceren Gökmenoğlu², Cankat Kara²

¹*Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Ordu University, Ordu, Turkey.*

²*Department of Periodontology, Faculty of Dentistry, Ordu University, Ordu, Turkey.*

Correspondence e-mail to: elifsadik@odu.edu.tr

ABSTRACT

The prevalence of complete edentulism varies from country to country and from one region to another. Previous studies have reported the high prevalence of significant radiographic findings in edentulous patients. **Objectives:** This study aimed to determine the prevalence of complete edentulism retrospectively and to evaluate the frequency and location of significant radiographic findings on panoramic radiographs in edentulous jaws of dental patients in northeastern Turkey. **Methods:** The digital panoramic images of all ≥ 35 year-old patients admitted to our faculty from January 2014 to August 2015 were evaluated. The prevalence of complete edentulism was determined among 8314 panoramic images retrospectively. Radiographic findings identified as impacted teeth, retained roots, radiopaque, and radiolucent areas detected in panoramic radiographs of completely edentulous patients (CEP) were recorded. The obtained data were analyzed with descriptive statistics and cross-tabs. Chi-square test was employed to evaluate the statistical significance of the results at 0.05 levels. **Results:** A total of 8314 panoramic images were examined, and 508 (6.11%) CEP were defined. The prevalence of edentulism was higher (24.85%) among the patients older than 64 years old. A total of 206 radiographic findings were detected on panoramic images of CEP. The prevalence values of retained roots, impacted teeth, radiopacities, and radiolucencies were 18.9%, 7.09%, 2.76%, and 1.57%, respectively. **Conclusions:** Given the high frequency of significant radiographic findings, the radiographic examination of CEP should be performed with consideration of the cumulative effects of radiation.

Key words: panoramic radiograph, prevalence, radiographic findings, tooth loss

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INTRODUCTION

Complete edentulism, defined as the loss of all natural teeth, is one of the most important indicators of oral health status.^{1,2} General and oral health problems directly influence the quality of life, particularly that of older adults.^{3,4} Although the prevalence of complete edentulism has decreased in the last decade, tooth loss remains an important disease worldwide.⁵ The prevalence of complete edentulism varies in terms of age, systemic conditions, socioeconomic status, health risk behaviors, and other health-related factors.²

Previous studies have reported the high prevalence of significant radiographic findings in edentulous patients.^{6,7} Panoramic radiography is the imaging modality used for producing a single image of

facial structures, which include the maxillary and mandibular dental arches, by using a quick and simple procedure.⁸ This technique is used frequently for the pre-treatment assessment of completely edentulous patients (CEP).^{6,7} However, the cumulative effects of radiation exposure raise concerns.⁷ In the radiographic selection criteria and guidelines reviewed by the American Dental Association/United States Food and Drug Administration, individualized radiographic examination based on clinical signs and symptoms is recommended for new adult edentulous patients.⁹

Reduction in the rate of tooth loss and the need for complete dentures have a powerful effect on dental education and treatment modalities.¹⁰ Therefore, data regarding the levels of tooth loss and the prosthetic treatment patterns of the population for all countries

must be obtained and the changes that occur over time be determined. The prevalence of complete edentulism varies from country to country and from one region to another.⁵ Thus, this study aimed to determine the prevalence of complete edentulism retrospectively and to evaluate the frequency and location of significant radiographic findings on panoramic radiographs in edentulous jaws of dental patients in northeastern Turkey.

METHODS

The study was performed in accordance with the principles of the Declaration of Helsinki. The digital panoramic images of all ≥35-year-old patients admitted to the Faculty of Dentistry of Ordu University from January 2014 to August 2015 were assessed retrospectively. This study included 8314 digital panoramic images that were obtained with a Kodak 8000C Digital Panoramic and cephalometric system (Carestream Health, Rochester, NY). All images were evaluated together by an oral and maxillofacial radiologist (ES) and two periodontists (CG and CK) simultaneously, and a common decision was reached for each evaluation. The examined panoramic images of patients with no erupted teeth were grouped as complete edentulous and those of patients with at least one tooth as dentate. Panoramic images of CEP were evaluated for positive radiographic findings, such as as impacted teeth, retained roots, and radiopaque and radiolucent areas.

The identified radiographic findings that resembled odontogenic or non-odontogenic cysts were categorized as radiolucencies and those that possibly indicated osteosclerosis, calcifications of soft tissues, and fibro-osseous lesions as radiopacities. The patients were not further subdivided given that a histologic examination was considered for definitive diagnosis. The distribution of positive radiographic findings was recorded in terms of location.

All statistical analyses were performed using Statistical Package for Social Sciences for Windows software, version 15.0 (IBM Corp., Armonk, USA). The obtained data were analyzed with descriptive statistics and cross-tabs. Chi-square test was employed to evaluate the statistical significance of the results at 0.05 level.

RESULTS

The study population consisted of 8314 patients (female/male, 4722/3592) with an average age of 50.38 ± 11.35 years. The minimum and maximum ages were 35 and 95 years old, respectively. A total of 508 (6.11%) CEP were defined by the examined panoramic images. The average age of CEP was 64.62 ± 9.76 years old (range: 35–87 years). The prevalence of edentulism was higher

Table 1. Distribution of edentulism in terms of age groups and sex

Demographic data	Total Sample (%)	Prevalence of edentulism (%)	p
Age in years			
35–64 (Adult)	7292 (87.71)	254 (3.48)	<0.001
65≥ (Elderly)	1022 (12.29)	254 (24.85)	
Sex			
Female	4722 (56.8)	304 (6.44)	0.153
Male	3592 (43.2)	204 (5.68)	
Total	8314 (100)	508 (6.11)	

*Differences in edentulism rate in different age groups and sex.

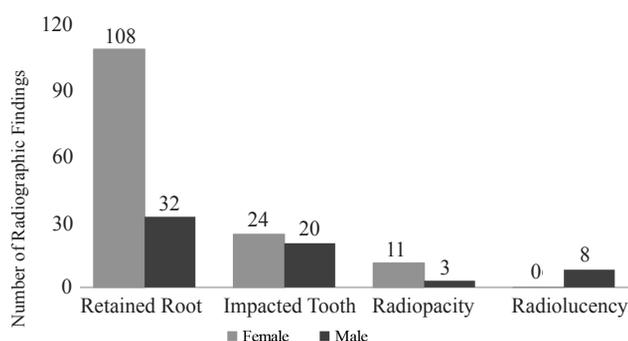


Figure 1. Distribution of positive radiographic findings among males and females.

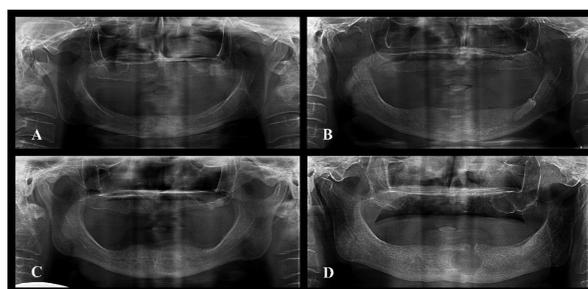


Figure 2. (A) Retained root, (B) impacted tooth, (C) radiopacity, (D) radiolucency.

(24.85%) among the patients above 64 years old. Out of the 508 CEP, 304 were female, and 204 were male (Table 1).

As shown in the panoramic images of CEP, both jaws were divided into three zones, namely, the right and left posterior (molar and premolar teeth region) and anterior (incisor and canine teeth region) zones, and they were examined for positive radiographic findings. A total of 206 radiographic findings were detected for 141 (27.76%) of 508 CEP (Figure 1).

Table 2. Location distribution of radiographic findings detected in panoramic radiographs of CEP

Radiographic Findings	Maxilla R-Posterior	Maxilla Anterior	Maxilla L-Posterior	Mandibula R-Posterior	Mandibula Anterior	Mandibula L-Posterior	Total
Impacted Tooth	5 (11.36)	8 (18.18)	6 (13.64)	2 (4.55)	2 (4.55)	21 (47.73)	44
Radiopacity	-	2 (14.29)	1 (7.14)	6 (42.86)	1 (7.14)	4 (28.57)	14
Radiolucency	2 (25)	-	4 (50)	1 (12.5)	1 (12.5)	-	8
Retained Root	37 (26.43)	8 (5.71)	54 (38.57)	13 (9.29)	8 (5.71)	20 (14.29)	140

(R: right; L: left); Values are given as n (%).

The prevalence values of retained roots, impacted teeth, radiopacities, and radiolucencies reached 18.9%, 7.09%, 2.76%, and 1.57%, respectively (Figures 2A–2D).

Retained roots were the most frequently detected finding in all radiographic results (67.96%). Of the 96 patients who had root fragments, 68 (70.83%) had one root fragment, 15 (15.63%) had two, 11 (11.46%) had three, 1 had four (1.04%), and 1 (1.04%) had five root fragments. Most of the retained root fragments were localized in the maxillary molar region (Table 2).

Exactly 44 impacted teeth were observed in 36 patients, 19 teeth (43.18%) were localized in the maxilla, and 25 teeth (56.82%) were in the mandible. In all identified impacted teeth, the maxillary and mandibular third molar teeth were observed most frequently (n = 11 and n = 20, respectively). Meanwhile, radiopacities were more common in the mandible, and radiolucencies were more common in the maxilla (Table 2).

DISCUSSION

Panoramic radiography has been widely used in screening and epidemiological studies.¹¹ In the current study, we examined the panoramic radiographs of adult and elderly patients with dental diseases to determine the prevalence of complete edentulism. Edentulism is one of the indicators of dental health among elderly people.¹² Data on the prevalence of tooth loss are scarce. Moreover, the rapidly changing dental health over the past four decades indicates that new data are needed regularly.¹³ Globally, complete edentulism shows a declining trend.¹⁴ However, intra- and intercountry differences exist in the prevalence of complete edentulism, and direct comparison between national samples is difficult due to the influence of various factors, such as education, lifestyle, economic conditions, and oral health attitudes.¹⁵

The elderly population of Turkey is rapidly increasing. According to the results of the population censuses conducted in 2008 and 2019, the ratio of the elderly population (individuals 65 years old and over) in the

whole population of Turkey increased from 6.8% to 9.1%.¹⁶ The first study at the national level was an epidemiological analysis of oral health in Turkey, and it showed that the prevalence of edentulism was 2.74% among the adult population and 75% among the elderly population.¹⁷ A study conducted in a retirement home in Ankara, Turkey in December 2003 reported that of the 193 elderly subjects, 130 were edentulous (67.4%).¹⁸ In another study conducted on 215 elderly patients attended by the faculty of dentistry in Kırıkkale, Turkey for routine dental treatment, 25 patients (11.6%) were completely edentulous.¹⁹ In a national survey examining the oral health status in Turkey, the prevalence of edentulism among 35–44 age group was 2.6%, and it rose to 48.0% in the 65–74 age group.²⁰ In the study, which was carried out between September 2004 and February 2005, the prevalence of edentulism for elderly age subject was 48%.¹² Bozdemir *et al.*²¹ reported that the prevalence of edentulism was 21.2% among 709 dental patients aged 60 years and over. Although the results of the studies conducted on samples selected based on the age groups of the general population showed a high rate of edentulism, the value was lower in studies performed on dental patients. According to these results, the rate of admission to dental hospitals may be low among elderly unless CEP have any complaints about the dentures they use.

In our study, we conducted a retrospective radiographic evaluation to determine the prevalence of edentulism among dental patients. This study indicated the prevalence of edentulism among adult subjects at 3.48%. This rate increased to 24.85% in elderly subjects. Given that our study was performed on patients attending a dental hospital, the results are inapplicable for generalization of the whole population. Further studies with more diverse sampling in multiple cities are needed to reach conclusions about the entire population in Turkey.

Second, we evaluated the panoramic images of CEP for positive radiographic findings as impacted teeth, retained roots, and radiopaque and radiolucent areas. Given that this research is a retrospective radiographic study, clinical findings were unknown for edentulous patients whose radiographs were examined.

Previous studies reported different positive radiographic findings among CEP, with the most common finding being the frequently retained roots.²²⁻²⁴ In our study, panoramic radiographic examination of CEP revealed positive radiographic findings, and retained roots were also the most frequently detected result. Most of the root fragments were found in the molar regions of the maxilla, and the majority of these fragments were found in the maxillary left posterior quadrant, in accordance with a previous study.²² The reason may be attributed to the root numbers and shapes of maxillary premolar and molar teeth and incorrect extraction technique used. We underline the need for careful extraction of maxillary posterior teeth, especially the left quadrant.

Impacted teeth are critically important in pre-operative planning for dental prostheses, especially dental implants in edentulous jaws. An impacted tooth can result in caries, pulp disease, periapical and periodontal disease, root resorption of the adjacent tooth, dentigerous cysts, infection of the facial space, temporomandibular joint disorder, and oral and maxillofacial tumor.²⁵ In previous studies of CEP, the rates of impacted teeth were in the range of 3.6%–6.3%.^{6,7,22,26} In the study conducted by Lyman and Boucher²⁷, one impacted tooth required extraction among the 300 edentulous patients. Based on this result, routine panoramic examination was not suggested for every edentulous patient to avoid the cumulative effects of radiation exposure. In this study, 44 impacted teeth were detected in 36 (7.09%) CEP. Given that our study was retrospective, whether the impacted teeth had symptoms was unknown.

In previous studies, the prevalence values of radiopacities and radiolucencies in edentulous jaws were between 1.5% to 12.1% and 0.9% to 2.5%, respectively.^{6,7,22,28} In the present study, although the prevalence of radiolucency was in accordance with that in previous studies^{6,7,22,28}, the prevalence values of radiopaque findings were slightly lower than those in the studies of Sumer *et al.*⁷ and Jindal *et al.*²²

CONCLUSION

Edentulism affects elderly populations. The radiographic examination of edentulous patients is important for determining asymptomatic non-clinical pathologies. Given the high frequency of significant radiographic findings, radiographic examination should be performed with consideration of the cumulative effects of radiation.

CONFLICT OF INTEREST

The authors have no conflict of interest.

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