# Age and Sex of Patients Undergoing Dental Radiologic Examinations

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## Abstract

As sociodemographic data can aid in making a diagnosis, treatment planning, and estimating patient prognosis, this study sought to quantify the frequency of distribution of patient visits to the radiology clinic according to different parameters and investigate the association of sex and age with undergoing radiographic dental examinations.

Dental radiography records collected from January 2016 to December 2017 (n = 13734) and 2017 (n = 13219) were included. The variables studied were age, sex, referral clinic, and radiographic technique applied (i.e., dental; panoramic; lateral cephalometric; posteroanterior cephalometric; occlusal; or positioning with the Accurad − 200™ from Whip Mix Corp., Fort Collins, CO, USA). The age groups were classified as follows: toddler (0–5 years), childhood (6–10 years), early adolescence (11–16 years), late adolescence (17–25 years), early adulthood (26–35 years), late adulthood (36–45 years), early elderly (46–55 years), late elderly (56–65 years) and senior (>66 years).

In terms of sex, more females than males underwent radiographic examinations in 2016 and 2017, with females accounting for 60% and 61% of all examinations performed per year, respectively. Based on age groups, patients aged 17 to 25 years underwent the majority of radiographic examinations performed in 2016 and 2017 (29.7% and 29%, respectively). Thus, there were significant differences regarding sex and age for radiographic examinations performed in 2016 and 2017 (Pearson's chi-squared test, p < 0.0001).

Females aged 17 to 25 years accounted for the majority of radiographic examinations conducted in 2016 and 2017.

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## Introduction

Dental radiography is warranted in some patient cases based on the recommendations of a dentist in the form of a referral letter. The referring dentist determines the type of radiographic imaging to be performed. Data relating to the examination and indications for the examination are documented in the patient's medical record[1]. Sociodemographic details are recorded as part of dental records. These data are important in case management as they can aid in making the diagnosis and in facilitating treatment planning and estimation of the prognosis. They can also identify the likelihood of return visits. Sociodemographic data also can act as a benchmark for treatment-seeking behavior and treatment adherence[2]. More broadly, sociodemographic factors can affect the success of patient care and disease severity.

In terms of sociodemographic data, sex and age can play important roles in disease profile, diagnosis, and treatment options and outcomes. Sex influences susceptibility to illness and illness behaviors, with females tending to be more aware of their disease than males[3]. Females are also more active seekers of health-related information than males[4]. Separately, age serves as an indirect indicator of the incidence of dental caries. Childhood is a period of significant vulnerability to dental and oral problems,

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including caries, with the latter influenced by toothbrushing frequency. Aging is associated with a gradual deterioration in tooth-supporting tissue, with tooth loss occurring in some cases. Elderly patients older than 46 years are susceptible to increased dental and oral problems because of physiological disorders and changes in bone metabolism that promote the disruption of masticatory and jaw joint function and porosity of the jawbone[5]. An analysis of radiographic data could shed light on the association of age and sex with dental problems.

To the best of our knowledge, only one study in Indonesia to date has examined the frequency distribution of age and sex by using radiographic dental records among patients who visit the dental hospital. This study included data on sociodemographic variables and radiographic techniques used and its purpose was to clarify the distribution of patients visiting a radiology clinic in Indonesia. Furthermore, this study investigates the association of sex and age with radiographic dental examinations.

### Materials and methods

The data were analyzed from Radiological administration records which categorized as secondary data. The data collection for the study were obtained by the approval from the Dental Hospital, Faculty of Dentistry, Universitas Indonesia. This study was approved by the Ethical Committee of the Faculty of Dentistry, Universitas Indonesia. (approval no. 35/ethical approval/FKGUI/III/2019). The study population was based on the records of patients referred for radiographic imaging in the radiology clinic of the Faculty of Dentistry, Universitas Indonesia. The research was conducted in 2018. The data analyzed from January 2016 to December 2017. The number of patient visits were 13734 in 2016 and 13219 in 2017.

The variables studied were age, sex, referral clinic, and radiographic techniques used (i.e., dental; panoramic; lateral cephalometric; posteroanterior cephalometric; occlusal; or using the Accurad-200™ from Whip Mix Corp., Fort Collins, CO, USA). Patients were divided into age groups as follows: toddler (0–5 years), childhood (6–10 years), early adolescence (11–16 years), late adolescence (17–25 years), early adulthood (26–35 years), late adulthood (36–45 years),

early elderly (46–55 years), late elderly (56–65 years), and senior (> 66 years)[6]. The data were further subdivided by sex.

Separately, referral clinic type was subdivided into integration clinics, conservation clinics, orthodontics clinics, pedodontics clinics, prosthodontics clinics, periodontics clinics, radiology clinics, oral surgery clinics, diagnostic clinics, and outside consuls. At the dental hospital of Universitas Indonesia, an integration clinic is a holistic clinic for students taking a Doctor of Dental Surgery (DDS) program. The referral letters from holistic clinic integrates conservation clinics, orthodontics clinics, prosthodontics clinics, periodontics clinics, and oral surgery clinics but not pedodontics clinics. In this study, the referral letters from conservation clinics, orthodontics clinics, prosthodontics clinics, periodontics clinics, and oral surgery clinics were from specialist students and postgraduate students, whereas the referral letters from pedodontics clinics were from DDS program students, specialist students, and postgraduate students.

Radiographic technique type was subdivided into dental periapical, panoramic, cephalometric lateral, cephalometric posteroanterior, occlusal, and temporomandibular joint projection (Accurad-200™).

### Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences version 20 software program (IBM Corp., Armonk, NY, USA). The association of age group and sex with the study variables was assessed using a chi-squared test, and the significance level was set at $p < 0.05$.

### Results

The frequency distributions of patients based on sex, age, and referral clinic from 2016 to 2017 are shown in Table 1.

The total number of individuals who underwent radiographic imaging decreased in 2017 (n = 13219) as compared with in 2016 (n = 13734). More females than males underwent radiographic examinations in both years, with average frequencies of 60% and 61%, respectively. In terms of age group, individuals aged 17 to 25 years accounted for 29.7% and

29% of radiographic examinations performed in 2016 and 2017, respectively. Separately, the frequency distribution of radiographic techniques is shown in Table 2.

|  |  | 2016 |  | 2017 |  |
|---|---|---|---|---|---|
|  |  | Frequency | (%) | Frequency | (%) |
| Sex |  |  |  |  |  |
|  | Male | 5494 | (40%) | 5155 | (39%) |
|  | Female | 8240 | (60%) | 8064 | (61%) |
|  |  |  |  |  |  |
| Age (year) |  |  |  |  |  |
|  | 0–5 | 395 | (2.9%) | 292 | (2.2%) |
|  | 6–11 | 1622 | (11.8%) | 1567 | (11.9%) |
|  | 12–16 | 428 | (3.1%) | 360 | (2.7%) |
|  | 17–25 | 4079 | (29.7%) | 3846 | (29%) |
|  | 26–35 | 2351 | (17.1%) | 2437 | (18.4%) |
|  | 36–45 | 1480 | (10.8%) | 1516 | (11.5%) |
|  | 45–55 | 1398 | (10.2%) | 1574 | (11.9%) |
|  | 56–65 | 964 | (7%) | 1215 | (9.2%) |
|  | >66 | 1017 | (7.4%) | 412 | (3.2%) |
|  |  |  |  |  |  |
| Clinics type |  |  |  |  |  |
|  | Integration | 4707 | (34.3%) | 4060 | (30.7%) |
|  | Conservation | 517 | (3.8%) | 526 | (4%) |
|  | Orthodontics | 590 | (4.3%) | 804 | (6%) |
|  | Pedodontics | 2021 | (14.7%) | 1761 | (13%) |
|  | Prosthodontics | 863 | (6.3%) | 795 | (6.1%) |
|  | Periodontics | 637 | (4.6%) | 598 | (4.4%) |
|  | Radiology | 226 | (1.6%) | 44 | (0.3%) |
|  | Oral surgery | 162 | (1.2%) | 88 | (0.7%) |
|  | Diagnostic | 3402 | (24.8%) | 3791 | (29.2%) |
|  | Outside consult | 609 | (4.4%) | 752 | (5.6%) |
| **Total** |  | 13734 | (100%) | 13219 | (100%) |

**Table 1.** Frequency distribution of patients based on sex, age group, and referral clinic from 2016 to 2017 Year.

There was no difference in the type of radiographic technique used in 2016 versus 2017, with dental and panoramic techniques being the first and second most commonly relied upon options in the dental hospital.

Figures 1 and 2 present the association of sex and age with radiographic examinations in 2016. In 2016 and 2017, the proportions of males and females who were 17 to 25 years old were significantly different as compared with in other age groups. There was a significant difference in terms of sex and age group in relation to radiographic examination visits in 2016 (Pearson's chi-square test, $p < 0.0001$) and 2017 (Pearson's chi-square test, $p < 0.0001$).

|  | 2016 |  | 2017 |  |
|---|---|---|---|---|
|  | Frequency | (%) | Frequency | (%) |
| Radiographic technique |  |  |  |  |
| Dental (periapical and bitewing) | 16158 | (75.4%) | 16922 | (73.2%) |
| Panoramic | 4131 | (19.3%) | 4883 | (21.1%) |
| Lateral cephalometric | 750 | (3.5%) | 938 | (4%) |
| Posteroanterior cephalometric | 74 | (0.3%) | 97 | (0.4%) |
| Occlusal | 161 | (0.8%) | 137 | (0.6%) |
| Accurad-200 | 151 | (0.7%) | 154 | (0.7%) |
| **Total** | 21425 | (100%) | 23131 | (100%) |

**Table 2.** Frequency distribution of different radiographic techniques in 2016 and 2017Year.
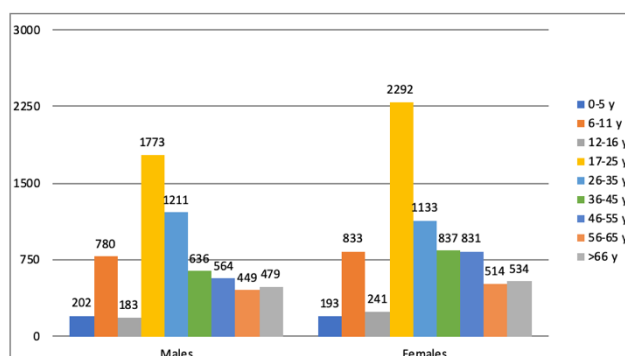


**Figure 1.** The association of sex and age group with radiographic examinations performed in 2016.
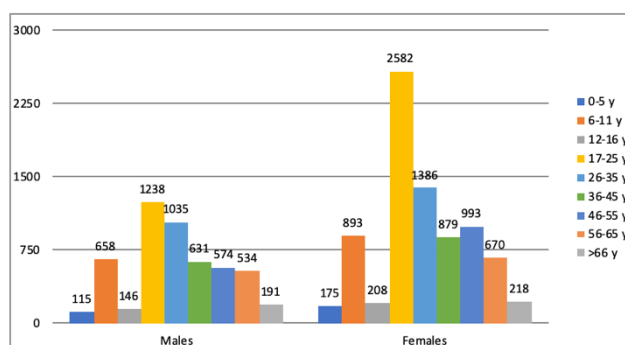


**Figure 2.** The association of sex and age group with radiographic examinations performed in 2017.

**Discussion**

This study revealed that females aged 17 to 25 years in 2016 and 2017 (Pearson's chi-square test, $p < 0.0001$) accounted for the largest proportion among all visitors referred to the

radiology clinic of a dental hospital in Indonesia. This finding was consistent with that of Deeks et al., who reported that females were more likely than males to undergo routine annual examinations and were more willing to seek advice from health care providers[7]. Elsewhere, Thompson et al. reported that females exhibited more health-seeking behaviors in response to physical health problems as compared with males[8]. Disregarding females, as shown in Figures 1 and 2, among males, those aged 17 to 25 years accounted for the highest number of visitors of this gender to the radiology clinic of the dental hospital. This age group tends to have access and physical abilities and enough time to visit health care providers to address problems with their physical health[9]. As reported previously, young individuals (i.e., 17–25 years) are also likely to be more health-aware and to show health-seeking behaviors to ensure that ill health does not interfere with their daily lives[10].

In the present study, older males appeared to visit the hospital radiology clinic less often than females of the same age. This finding was consistent with that of a previous study, which suggested that males have a lower pain threshold and tend to avoid routine health care examinations as they aged[7]. Age and gender also influenced intentions to seek professional help. Females seek more health care in response to both physical and mental health concerns. Females exhibited more favourable intentions to seek help from mental health professionals than males, likely due to their positive attitudes concerning psychological openness[11]. Research has demonstrated that males are less interested in or concerned about their health, and therefore may be less likely to seek help for health-related problems[1]]. This finding may also explain the increased number of females visitors aged 17 to 25 years in 2017.

The integration clinics and diagnostic clinics accounted for the two most predominant sources of referral patients, while pedodontics clinics were the third most common source of referrals. As these clinics are not part of integration clinics, they demonstrated higher numbers of visitors relative to the other clinics except for integration and distribution clinics. Most dental radiographs are used to confirm a diagnosis and treatment plan and are used less often for treatment evaluation. This was also the case in the present study, with the highest numbers of referrals for dental or intraoral radiographic imaging coming from integration clinics first, followed in order by diagnostic clinics and pedodontics clinics.

Dental or intraoral radiography is used to examine dental abnormalities, including caries detection and expansion, the condition of restorations, and the state of periodontal tissue[12,13]. Previous research found that children younger than 12 years of age were at higher risk than other age groups of dental and oral problems, particularly caries[14]. The findings of the present study are in accordance with this idea, with pedodontics clinics delivering the third-highest number of patients in order after integration clinics and diagnostic clinics. In terms of the relationship between patient referrals and age groups, those aged six to 11 years accounted for the third-highest number of referrals. Among extra-oral radiography, the panoramic radiographs were the most commonly used in general dental practices. For diagnostic examinations and research, significant data are available from the teeth and their supporting structures, including the maxillary and mandibular dental arches[15].

Some limitations of this study should be considered. Due to the fact that not all potentially relevant data were available in the consul's letter such as data regarding the purpose of radiographic examination, suspected diagnosis, and treatment plan, this study did not consider this information. Further research is needed to compare variables between dental patient hospital visits and dental patient radiology examinations and to analyze the relationships between such.

### Conclusions

Females aged 17 to 25 years accounted for the largest population according to age and sex who underwent radiographic examinations in response to referrals to a single center in Indonesia in 2016 and 2017.

### Acknowledgements

## Declaration of Interest

The authors declare no potential conflicts of interest concerning the research, authorship, or publication of this article exist.

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