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Distribution of dental anomalies in panoramic radiography at RSGMP Universitas Airlangga

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ABSTRACT

Objectives: This research was aimed to determine the distribution of dental anomaly cases on panoramic radiographs at Universitas Airlangga Dental Hospital (RSGMP).

Materials and Methods: This research used a descriptive observational design with a total sampling technique from panoramic radiographic data at the Radiology Clinic of RSGMP Universitas Airlangga during 2018–2020, which had cases of dental anomalies.

Results: The result showed 116 cases of dental anomalies, with more incidence in female (64%) than in male (36%). The most common dental anomaly category was the number of teeth anomalies (47.41%), followed by tooth size anomalies (29.31%), tooth shape anomalies (23.28%), and there were no cases of anomalies in tooth structure and position. The most common types of dental anomalies were microdontia (27.59%), missing teeth/agenesis (25%), supernumerary teeth (22.41%), dilaceration (16.38%), talon cusp (3.45%), taurodontism (2.59%), macrodontia (1.72%), gemination (0.86%).

Conclusion: The most common cases of dental anomalies were based on their categories, namely anomalies in the number of teeth, followed by tooth size, and tooth shape.

Keywords: *Health services, distribution, dental anomalies, panoramic radiography*
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INTRODUCTION

According to the Regulation of the Minister of Health of the Republic of Indonesia, Article 1, Number 1173, 2004, a public health service facility that provides dental and oral health services in the form of treatment and recovery services with health promotion and disease prevention carried out through outpatient, emergency services, and medical action. Based on its function, Rumah Sakit Gigi Mulut Pendidikan (RSGMP) Universitas Airlangga is an educational dental and oral hospital that provides dental and oral health services. Besides that, it is also used as a means of learning, education, and research for dental students.[1]

Radiography is an imaging technique using X-rays that aims to project an image of a clinically invisible body part that makes it easier to diagnose a disorder or disease, determine treatment plans and evaluate the results of treatments that have been carried out.[2] Radiography has an important role in the field of dentistry because more than 80% of cases of dental and oral disease management require a radiographic examination. There are two imaging technique, namely intra-oral and extra-oral techniques.[3] One of the extra-oral radiography techniques is panoramic radiography which can describe the morphology and relationships of the dentomaxillofacial components, observing growth and development, and can be used to see any abnormalities in the dentomaxillofacial area including dental anomalies.[4]

A dental anomaly is one of the disorders related to the growth and development of teeth. There are several types of abnormalities, including the number of teeth, tooth size, tooth shape, tooth structure, and tooth position.[5] Anomalies in teeth quite often cause complications in dental treatment, such as root canal treatment, tooth extraction, and orthodontic treatment. Dental anomalies can complicate endodontic treatment because of abnormalities in the shape of the teeth. For example, teeth with dens invaginatus can complicate access to the root canal.[6] Dental anomalies are often found in patients undergoing orthodontic treatment. According to several studies, orthodontic patients had at least one dental anomaly. The high incidence of anomalies in orthodontic patients requires dentists to pay more attention to the initial examination for their presence. This is because dental anomalies have an important role in the occlusion and alignment of teeth, so the presence of dental anomalies will

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affect the planning and success of orthodontic treatment.[7]

There are several studies from various countries regarding the prevalence of dental anomalies. Research in Turkey conducted by Bilge et al[5] found that the prevalence of dental anomalies that occur in women is 54%, while in men it is 46%. The most common types of dental anomalies were impacted teeth (45.5%), dilacerations (16.3%), hypodontia (13.8%), and taurodontism (11.2%). Research in Thailand[8], 29.16% of the cases were dilacerations, 13.17% were missing teeth, 7.21% were microdontia, 3.29% were taurodontism, 2.66% were supernumerary teeth, and 1.56% were transpositions.

RSGMP Universitas Airlangga found many cases of dental anomalies that were found accidentally on panoramic examinations because there were no complaints from patients. However, until now, there has been no research that presents data related to the number of cases of dental anomalies through panoramic radiography at RSGMP Universitas Airlangga. Based on this background, researchers are interested in conducting research to find out the description of the distribution of dental anomaly cases in patients who come to the RSGMP Universitas Airlangga in terms of panoramic radiographs.

MATERIALS AND METHODS

This research was conducted in an observational-descriptive by exploring data from panoramic radiographs to describe the distribution of dental anomalies on panoramic radiographs at RSGMP Universitas Airlangga. The population of this study was all data from panoramic radiographs taken at the Radiology Clinic of RSGMP Universitas Airlangga during 2018-2020. The sampling technique was carried out by taking all samples of panoramic radiographic data that met the inclusion criteria. The sample criteria used are panoramic radiographic data that has good evaluation quality and has cases of dental anomalies. Missing teeth/ agenesis in adult needs to be checked in the medical record if there is a history of patient extraction or trauma, and the size and shape of the anomaly need to be checked in the medical record if there is any history of orthodontic or endodontic treatment.

The research was conducted at the Dental Radiology Clinic of RSGMP Universitas Airlangga in September-December 2021. This research has been conducted as an ethical test at the Health Research Ethics Commission, Faculty of Dentistry, Universitas Airlangga with no. 404/HRECC.FODM/VII/2021. The tools and materials used were a computer, stationery, and panoramic radiography medical record data belonging to RSGMP Universitas Airlangga. The data was selected according to the inclusion criteria. Observations were made on panoramic radiographs of cases of dental anomalies by the researcher with the assistance of two supervisors. The cases obtained from the interpretation of the panoramic radiographs were collected and grouped according to the existing dental anomaly categories, namely abnormalities in the number of teeth, tooth size, tooth shape, tooth structure, and tooth position. The data is compiled, presented in table form, and analyzed. Data analysis used descriptive analysis in the form of frequency, mode, and percentage, so that the distribution of dental anomaly cases on panoramic radiographs at RSGMP Universitas Airlangga can be seen during 2018–2020.

RESULTS

From 1,317 panoramic radiographic data, 116 cases of dental anomalies (8.81%) were found, 36% of them were male and 64% female. The results of the study in Figure 2 show that the most common dental anomaly cases on panoramic radiographs based on the category were the number of teeth 55 cases (47.41%), followed by anomaly in tooth size 34 cases (29.31%), there were 27 cases of anomaly in tooth shape (23.28%), and no cases of anomaly in tooth structure and tooth position were found.

The results of the research in Figure 3 show that the most common types of dental anomalies are microdontia 32 cases (27.59%), then missing teeth/ agenesis 29 cases (25%), supernumerary teeth 26 cases (22.41%), dilaceration 19 cases (16.38%), talon cusp 4 cases (3.45%), taurodontism 3 cases

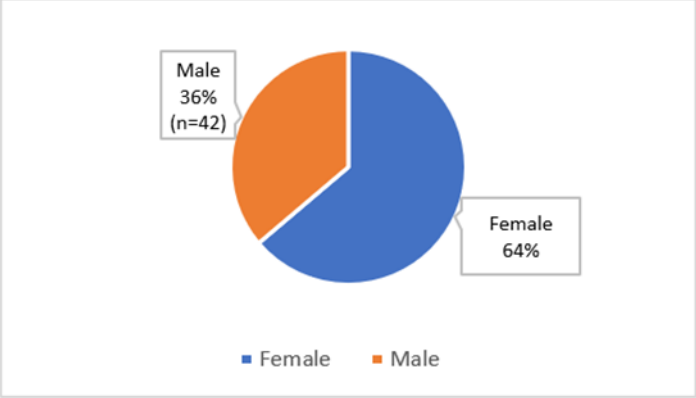

Figure 1. Percentage of dental anomalies discovered in male and female

Table 1. Percentage of dental anomalies in panoramic radiographic data at the RSGMP Universitas Airlangga in 2018-2020

Dental Anomaly Category	Total	Percentage	Type of Dental Anomaly	Total	Percentage
Number of Tooth	55	47,41 %	Supernumerary teeth	26	22,41 %
			Missing teeth/agenesis	29	25 %
Tooth Size	34	29,31 %	Macrodontia	2	1,72 %
			Microdontia	32	27,59 %
Tooth Shape	27	23,28 %	Taurodontism	3	2,59 %
			Dilaceration	19	16,38 %
			Fusion	0	0 %
			Gemination	1	0,86 %
			Talon cusp	4	3,45 %
			Dens in dente	0	0 %
			Concrescene	0	0 %
Tooth Structure	0	0 %	Amelogenesis imperfecta	0	0 %
			Dentinogenesis imperfecta	0	0 %
			Dentine dysplasia	0	0 %
Tooth Position	0	0 %	Transposition	0	0 %
	116	100 %		116	100 %

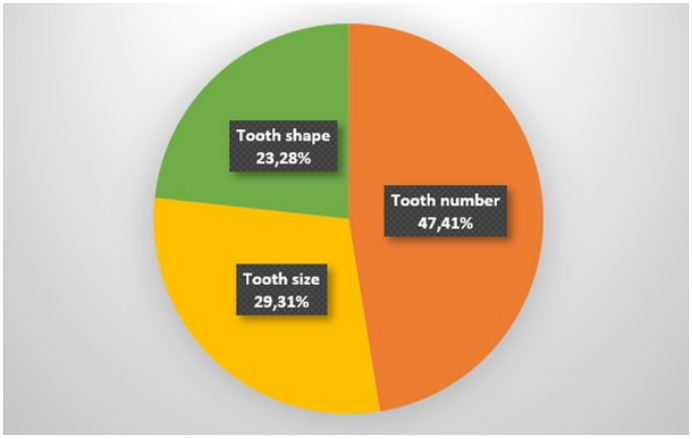

Figure 2. Percentage of dental anomalies by category of anomalies

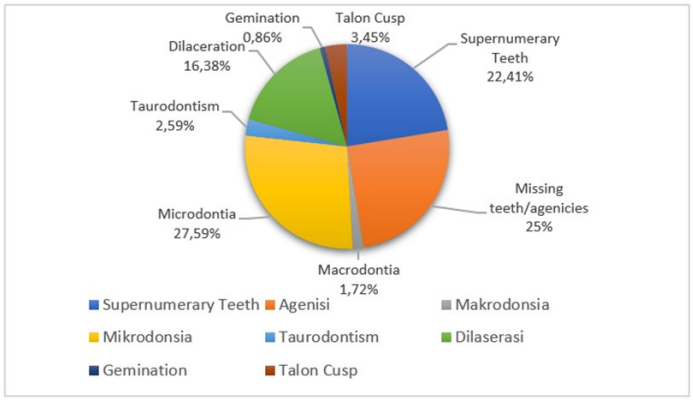

Figure 3. Percentage of dental anomalies by type of anomalies

(2.59%), macrodontia 2 cases (1.72%), gemination 1 case (0.86%). Other anomalies, such as fusion, dens in dente, concrescene, amelogenesis imperfecta, dentinogenesis imperfecta, dentine dysplasia, and transposition were not discovered at all.

The results of the study in table 2 show that the classification of supernumerary teeth based on

Table 2. Type of supernumerary teeth

Type of Supernumerary Teeth	Total	Percentage
Mesiodens	2	1,72%
Paramolar	17	14,66%
Distomolar	7	6,03%
Total	26	22,41%

Table 3. Type of missing teeth/agenesis

Type of Missing Teeth/Agenesis	Total	Percentage
Hypodontia	23	19,83%
Oligodontia	6	5,17%
Total	29	25%

their location: supernumerary-paramolar 17 cases (14.66%) were the most, followed by distomolar 7 cases (6.03%), and the least is mesiodens 2 cases. (1.72%). The results of the study in table 3 show that the most common dental anomalies based on the classification of missing teeth/ agenesis was hypodontia 23 cases (19.83%), and followed by oligodontia 6 cases (5.17%).

DISCUSSION

From 1,317 data points obtained from panoramic radiographic data during 2018–2020 at RSGMP Universitas Airlangga, 116 dental anomalies (8.81%), with the incidence in female 64%) more than in male (36%). In a study conducted by Saberi et al[9], the prevalence of dental anomalies was 18.17%, of which cases in women were also higher than in men.

The results of the study by category showed that the most common dental anomalies on panoramic radiographs were found in the category of abnormalities based on the number of teeth 47.41%, followed by tooth size anomalies 29.31%, and tooth shape anomalies 23.28%, and there were no cases of anomalies in tooth structure and tooth position.

Of the five categories of dental anomalies, the most dental anomalies were found was the number of teeth anomalies at 47.41%, with missing teeth incidence 25%, higher than supernumerary teeth 22.41%.

The most common missing teeth in this study was hypodontia 19.83%, while oligodontia accounted for only 5.17% of the total missing teeth cases. This is in accordance with previous research conducted by Yassin[10] in which cases of dental anomalies that often occur are anomalies in the number of teeth, with the most common type of anomaly being in the form of hypodontia. Congenital missing teeth of permanent teeth is one of the most common causes, although the location of the missing teeth is reported to differ by race. The incidence of missing teeth in European and Caucasian populations is often found in the mandibular second premolars, followed by the maxillary and mandibular central incisors, and the maxillary second premolars. In the Japanese population, the mandibular lateral incisor was most commonly found, whereas in the Indian population it was most commonly found in the maxillary lateral incisor. Karadas et al[11] also reported that maxillary lateral incisors were most common. The results obtained from this study were in accordance with the research in India, namely that there were more missing teeth of maxillary lateral incisors, followed by mandibular lateral incisors, and maxillary and mandibular second premolars. So the location of the missing teeth can be determined by race. Missing teeth is a congenital abnormality caused by a disturbance in the early stages of tooth development. The causes are quite diverse, such as environmental factors and genetic factors, including trauma, infection, and drugs.[12]

Supernumerary teeth based on their location in the premolar region (Paramolar) had the highest incidence of 14.66%, followed by the distal second molar region (Distomolar) of 6.03%, and the lowest was the incisive region (Mesiodens) of 1.72%. In this study, there were more supernumerary teeth in males than in females. This is in accordance with research conducted by Ata-Ali et al[13], where supernumerary teeth in permanent teeth are usually rare in women. The relationship between the incidence of supernumerary teeth and race or ethnicity is still controversial. In some studies, the incidence of non-white races is quite high, but in other studies there are no reported racial differences. A study in Japan reported a very low prevalence of this anomaly (0.05%) compared to China (0.44%), Caucasians (0.64%), and Finland (0.4%). There are also studies that report significant differences in Japan and China, even though both are Mongoloid races. Therefore, more studies should be carried out to prove the relationship between the two.[14] The etiology of supernumerary teeth remains unclear. There are several theories, one of which is the hyperactivity theory of the dental lamina, whereby supernumerary teeth are formed from hyperactivity of the dental lamina, which develops into an extra tooth bud, and supernumerary teeth are formed. In addition, there is a phylogenetic atavism process that can explain the development of supernumerary teeth and the dichotomy theory, which states that the tooth germ splits into two equal or different parts and produces two teeth of the same size or normal or dysmorphic

sized teeth. Supernumerary teeth can cause crowding, interfere with tooth eruption, retention of teeth, abnormal tooth root formation, and cysts.[15,16]

The most common tooth size anomaly found in this study was microdontia 27.59% of all anomaly cases. The incidence of microdontia mostly occurred in the posterior teeth or third molars. Based on research by Puranik & Gandhi[17], cases of microdontia often occur in lateral incisors and third molars according to this study. Incidence of microdontia in women was higher. The etiology of microdontia is commonly associated with dwarfism due to pituitary gland hypofunction. Atavism can be the cause of imperfect tooth development, which results in cone-shaped teeth.[16] Several studies have stated that cases of microdontia occur in patients with Down syndrome.[17]

In this study macrodontia, accounting for 1.72% of all cases. Likewise, in the research conducted by Kathariya et al[18] and Yassin[10], which found cases of macrodontia with a prevalence of 1.3% and 1.8%. Macrodontia is a rare condition and is generally associated with gigantism due to hyperpituitary, which can cause the length of the bones and teeth to be longer than normal. Other systemic conditions that affect macrodontia include insulin-resistant diabetes, oto-dental syndrome, KBG syndrome, and XYY syndrome. The prevalence of the incident is reported to be higher in males. In addition, it can be caused by marriage between parents who have small jaws and large teeth, so that one gene is more dominant. This condition could be the reason why, in this study, only a few macrodontia were found.[16,17]

In this study, the most common dental anomaly among all types of dental deformity was dilatation, which accounted for 16.38% of the total anomaly cases. Most of the dilacerations were found in the posterior teeth, especially the mandibular third molars. Dilaceration cases are often followed by a history of trauma to the primary teeth, where the teeth are pushed apically or into the jaw[16]. Most cases of lacerations were found in women compared to men, in line with the study of Majeed et al[19], which reported that cases of lacerations in women and men were 66.67% and 33.33%. Root lacerations are quite difficult to find on panoramic radiographs because panoramic techniques alone are not the method of choice to see this anomaly case, especially lacerations that occur on the buccal/labial or palatal/lingual side. Thus, different radiographic techniques are needed to assist in the diagnosis.[20]

The incidence of talon cusp is as much as 3.45% of the total anomaly. It is the most anomalous tooth shape after laceration. In this study, the cases of the talon cusp in women and men were equally large, which is the same result as the study conducted by Mostafa et al[21]. Meanwhile, Sreeshyla's research[22] reported that the incidence of talon cusp in women was higher than in men. This may be due to the difference in the number of samples observed. Talon cusps located on the canines and incisors usually originate from the palatal cingulum as tubercles protruding from the palatal surface. Anomalies of this etiology are quite diverse, including environmental and genetic factors. Talon cusps occur due to disturbances during the morphodifferentiation or odontogenesis stage that affect the shape and size of the teeth. This anomaly can also be influenced by trauma that affects the tooth germ or hyperactivity of the dental lamina.[16] Examination of the talon cusp on panoramic radiographs is sometimes difficult because of the superimposition of the talon cusp with the dental crown. So other techniques are needed, such as CBCT to help diagnose.[23]

Taurodontism and gemination were the least common dental anomalies after dilaceration and talon cusp, which were 2.59% and 0.86% of the total anomaly cases, respectively. Taurodontism is an anomaly in tooth development that is characterized by the absence of constriction of the cementoenamel junction (CEJ) so that the pulp chamber is more apical and appears wider than normal. In this study, there was no significant gender difference in the case of taurodontism. However, there are studies that state that the prevalence in men is lower than in women. These results are based on studies of chromosomes in males with an extra X chromosome such as 47XXY (Klinefelter's syndrome), indicating that the X chromosome may contain genes that influence the development of taurodontism teeth. This may be related to the higher frequency of taurodontism in normal women[24]. The rarity of gemination cases is in line with the research conducted by Mostafa et al[21], which only reported one gemination case, and the study of Hagiwara et al[25], which showed a prevalence of gemination of 0.01%. The etiology of gemination is caused by the division of the tooth germ during the development of the tooth, or during the bud stage, fusion occurs where the normal tooth then fuses with the developing supernumerary teeth, so that this anomaly can be mistaken for the occurrence of supernumerary teeth.[16]

In this study, there were no anomalies in the shape of the teeth in the form of fusion, dens in dente, and concrescene. Similarly, anomalies in tooth structure such as amelogenesis imperfecta, dentinogenesis imperfecta, and dentin dysplasia, as well as anomalies in tooth position in the form of transposition, were not found. The absence of this anomaly could be caused by differences in race, variations in patient age, and the number of samples. If more samples are used, the possibility of finding this anomaly will also be greater.

CONCLUSION

Based on the research data, the highest percentage of dental anomalies based on the category, namely anomalies in the number of teeth, followed by tooth size, and tooth shape. Meanwhile, anomalies in the structure and position of the teeth were not found.

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None.

FOOTNOTES

All authors have no potential conflict of interest to declare for this article. This study has received ethical approval approved by the Health Research Ethical Clearance Commision Faculty of Dental Medicine Universitas Airlangga (404/HRECC.FODM/VII/2021). All procedures conducted were in accordance with the ethical standards.

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