A Retrospective Radiographic Study for the Prevalence of Dental Anomalies in the Population of Faridabad City

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***Abstract*—Objectives: The prevalence of dental abnormalities varies among different populations and can reflect genetic, environmental, and cultural variables. The present study aimed to assess the prevalence of various dental anomalies by analyzing the panoramic (OPG) records of an institution.**

Methods: 944 pretreatment OPGs were analyzed for dental anomalies in patients who visited an institution between June 2024 and November 2024. OPG images will be reviewed for the following dental anomalies: impacted teeth, taurodontism, dilaceration, microdontia, hypercementosis, distomolar, fusion, and anodontia. The data obtained was entered into an Excel sheet, and descriptive analysis was done. Chi-square tests and multivariate analysis of variance will be used, and the P value was fixed at ≤0.05.

Results: The total number of anomalies found in the studied population was 294; the distribution was more prevalent in males. However, no significant difference was found in gender-wise comparison. Considering the age ranges, significant (p=0.006) impaction was found in 16-30 years of age. Dilaceration was noticed more at 40-60 years of age and least at 16-30 years (p=0.019). The prevalence of microdontia was found to be higher at 46-60 years of age and at least at 16-30 years (p=0.007).

Conclusion: There was no difference between males and females for dental anomalies. Impaction, dilaceration, and microdontia were prevalent in certain age groups. However, multicentric studies should be planned to include a heterogeneous population and for more conclusive results.

***Index Terms*—Tooth abnormalities, Anodontia, Dental anomalies, Radiography**

I. INTRODUCTION

Dental anomalies are developmental disorders that cause tooth number, size, shape, and structure abnormalities. These irregularities can have a substantial impact on oral health and can create functional problems, aesthetic concerns, and psychological distress. The prevalence of dental abnormalities varies among different populations and can reflect genetic, environmental, and cultural variables [1]. Developmental abnormalities occur during the tooth-developing process and can vary in severity from isolated, basic flaws to signs of particular syndromes. Developmental dental abnormalities depart from normal tooth color, contour, size, quantity, and development. Developmental disruptions may be caused by local and systemic influences [2]. Supernumerary teeth and other dental malformations have a strong hereditary component that can be passed down through either of the parents. External factors, such as damage or illness during tooth development, can induce dental anomalies such as dilacerationor ectopic eruption [1]. Numerous studies have examined the incidence of dental anomalies in various communities and ethnic groups; however, differences in several parameters, including race, sampling techniques, and diagnostic criteria, have produced conflicting results within and between cultures [3]. A multidisciplinary approach is necessary to manage these anomalies. Understanding the epidemiology of these issues is crucial for disease control and reducing morbidity. Furthermore, understanding the type, prevalence, and causation of developmental defects might aid in prompt treatment planning and management [4]. Abnormality frequency and expression levels give crucial evidence for genetic and phylogenetic studies in various population groups. It aims to provide insight into demographic differences and probable occurrences [5]. Proper diagnosis reduces difficulties in treatment regimens. These anomalies may involve one tooth or multiple teeth, or presented anomalies may be present as a part of any systemic syndromes. One or more

dental anomalies can often be observed in the same patient [6]. An enamel defect during the developmental stages can lead to tooth sensitivity or aesthetic problems. Besides, dental anomalies can result in malocclusion and impairment in tooth eruption and dental arch development. Long-term dental anomalies can also lead to occlusal and maxillofacial deformities if left untreated. Early diagnosis enables the right patient care and treatment planning and can decrease therapy problems and the cost and difficulty [4].

Panoramic radiography, or orthopantomogram, is the most popular method for creating a single picture of the facial structure, including dental arches and supporting structures. The benefits of this treatment include extensive teeth coverage and minimal radiation exposure for patients [7]. Radiography, together with clinical observations and examinations, is crucial for diagnosing dental anomalies and determining differential diagnoses. Early diagnosis of dental abnormalities is crucial for treatment and preventing negative consequences [8]. There have been several studies in different regions of India on the prevalence of dental anomalies, but in the Faridabad region, there has not been a single study, as per the author's knowledge. Hence, the present retrospective study was planned to evaluate the prevalence of dental anomalies among the patients who visited an institute in Faridabad by evaluating the panoramic radiographs.

II. METHODOLOGY

A retrospective study was conducted in an institute in Faridabad. Ethical clearance was obtained from the institution (MRIIRS/MRCD/SDS/IEC/2024/79) on 24th July 2024. The study aims to determine the frequency of dental anomalies determined through Orthopantomography (OPG) examinations in patients seeking dental care in the Faridabad region.

Sample Size Calculation

The sample size calculation was based on the formula. It considers the significance level, Margin of error, and proportion based on previous studies and was calculated to be 468. The sample size for the present study was kept to 944.

$$n = \frac{P * (1 - P) * Z_{(\frac{\alpha}{2})}^{2}}{E^2}$$

III. METHOD

The study was approved by the ethical board of the institution, and no unnecessary exposure was done to the patients for the study, as these OPGs were carried out for routine investigations. No personal patient information was documented, and strict confidentiality was maintained to protect privacy. Inclusion criteria included that the OPG must be taken from subjects aged between 16 and 85 years old, good quality radiographs, and all upper and lower teeth must be included in the OPGs. Poor-quality radiographs and OPG with distortion or elongated images of the teeth

were excluded Patients with syndromes associated were also excluded from the study. The sample size included 944 pretreatment OPGs and dental information from patients seeking treatment in the department from June 2024 to November 2024.

Demographic data, including the sex and age of each patient, will be recorded based on the available information within the dataset. The reviewers will first review each OPG image. TheOPG images will be reviewed for the following dental anomalies: impacted teeth, taurodontism, dilaceration, microdontia, hypercementosis, distomolar, fusion, and anodontia.

IV. STATISTICAL ANALYSIS

Version 28 of the Statistical Package for the Social Sciences (IBM Corp., Armonk, NY, USA) will be utilized to analyze the data, chi-square tests and multivariate analysis of variance will be used, and the P value was fixed at ≤ 0.05. Multivariate analysis of variance will be conducted to examine whether the presence of a particular type of anomaly can indicate the existence of other anomalies.

V. RESULTS

The distribution of the population according to demographics like males and females and distribution in different age groups is shown in Table 1.

The total number of anomalies found in the studied

population was 294; the distribution in males was 167, while in females, it was found to be 127. The prevalence of impaction was noticed more at 16-30 years of age, and the lowest was found at 40-60 years; the results were statistically significant (p=0.006). Dilaceration was noticed more at 40-60 years of age and least at 16-30 years; the results were found to be statistically significant (p=0.019). The prevalence of microdontia was found to be higher at 46-60 years of age and at least at 16-30 years; the results were found to be statistically significant (0.007). The prevalence of all other dental anomalies was insignificant when compared to different age groups [Table 2]. The prevalence of individual dental anomalies is described in Table 3. Out of the 944 studied population, 294 anomalies were found, which was 31%. Out of 294, 12% of patients showed two or more dental anomalies. When prevalence was compared in males and females of the studied population, the results were non-significant [Table 4].

VI. DISCUSSION

The present study was conducted to assess the prevalence of dental anomalies in an institution located in Faridabad city by analyzing the pretreatment OPGs archived from the institution's radiology department. Patients with syndromes associated with dental anomalies or missing teeth were excluded from the study, i.e., cleft lip and palate, ectodermal dysplasia, etc. Radiographic evaluation is a vital tool for the diagnosis of any type of anomaly. The Total Prevalence of anomaly from the total population was found to be 31%. In a study conducted in India by Gupta et al [9], the prevalence was found to be 34.28%. In another Indian study conducted by Anitha et al. in 2018 [10] and Mohan et al [11], the prevalence was found to be very low (2.18%) and (5.83%), contrary to our results. The reason may be attributed to the large sample size and different geographic population.

Dental anomalies can vary from mild rotation to complete agenesis. Malalignment can be associated with dental anomalies [12]. The palatal displaced canine was associated with peg laterals in 34% of patients [13]. There was no association of anomaly with either sex. These findings were similar to other studies [14]. The anomaly associated with tooth form can also lead to difficulty in management for restoration or rehabilitation. The most prevalent dental anomaly found in our study was dilaceration, followed by impacted teeth. In a study by Jain et al. in Madhya Pradesh, hypodontia was more common in number anomaly and microdontia in size anomaly of dental origin [15]. They evaluated equal sample sizes of males and females in the age range of 10-40 years of age. The prevalence of impacted teeth was found to be 5.5% in one of the Indian studies conducted in 2020 [3], while in our study, it was 38.77%. The reason is that they had excluded the third molars from their study. There was a significant difference in impaction, dilaceration, and microdontia concerning age. The range of prevalence of different anomalies varies in the literature. The reason may be due to different age ranges selected, population size, or heterogeneity in the population studied.

Impaction was more prevalent in the young age group (16-30 years). The reason may be that the older population might have undergone an extraction of impacted teeth, which could not be witnessed in panoramic radiography. Dilaceration was more prevalent in individuals aged 46-60 years. The hypothesis behind dilaceration is trauma during tooth formation, which alters the angle between the developing part and the developed part of the tooth. The severity of tooth angulation depends on age and the force applied during eruption [16]. Microdontia was also more prevalent in individuals aged 45-60 years. The prevalence of microdontia was found to be in the range of 0.8% to 8.4% in different populations [17].

VII. LIMITATIONS AND FUTURE SCOPE

The results of the present study can't be generalized as the sample size was small and included only one institution. Hence, future multicentric studies with large sample sizes and other anomalies included should be conducted.

VIII. CONCLUSION

Dilaceration and impacted teeth are the most common anomalies seen in our study. Radiographic evaluation by OPG is a useful tool for diagnosis and clinical correlation of the disease for early prevention. Early prevention of these anomalies can prevent alteration in the stomatognathic system. The

results are attributable to only a single geographic population, so future studies, including heterogeneity in population with other common anomalies, should be conducted so that the treatment strategies pertaining to prevalent anomalies for particular geographic distribution can be planned.

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Tables

Table 1 – Demographic distribution of population

Total sample collected (n= 944)	
According to gender	

Males	494
Females	450
According to age	
16-30yrs	
Males	174
Females	158
31-45yrs	
Males	150
Females	146
46-60yrs	
Males	88
Females	110
Above 60yrs	
Males	82
Females	36

Table 2: Relationship between age groups and dental anomalies among the samples

	Age Groups	Mean	Std. Deviation	F-Value	P-Value
Impacted	16-30 Years	1.08	1.25	4.337	0.006
	31-45 Years	0.66	1.10		
	46-60 Years	0.16	0.472		
	Above 60 Years	0.9	1.30		
Taurodontism	16-30 Years	0.06	0.516	0.275	0.843
	31-45 Years	0.03	0.192		
	46-60 Years	---	---		
	Above 60 Years	---	---		
Dilaceration	16-30 Years	0.71	1.180	3.437	0.019
	31-45 Years	1.41	1.622		
	46-60 Years	1.64	1.655		
	Above 60 Years	1.09	1.044		
Microdont	16-30 Years	0.25	0.913	4.190	0.007
	31-45 Years	0.32	0.995		
	46-60 Years	1.16	2.095		
	Above 60 Years	---	---		
Hypercementosis	16-30 Years	0.03	0.181	0.637	0.592
	31-45 Years	0.07	0.384		
	46-60 Years	---	---		
	Above 60 Years	---	---		
Distomolar	16-30 Years	0.05	0.219	0.201	0.895
	31-45 Years	0.03	0.192		
	46-60 Years	0.04	0.200		

	Above 60 Years	---	---		
Fusion	16-30 Years	0.06	0.516	0.589	0.623
	31-45 Years	0.16	0.579		
	46-60 Years	0.12	0.331		
	Above 60 Years	---	---		
Peg lateral	16-30 Years	0.06	0.362	0.155	0.926
	31-45 Years	0.03	0.274		
	46-60 Years	0.04	0.200		
	Above 60 Years	0.09	0.301		

Table 3: Prevalence of individual anomalies in the studied population

Dental anomaly	Total	Gender		Prevalence in %
		Male	Female	
Impacted	114	68	46	38.77
Taurodontism	6	6	0	2.04
Dilaceration	79	32	47	26.87
Microdontia	61	38	23	20.74
Hypercementosis	6	2	4	2.04
Distomolar	6	4	2	2.04
Fusion	16	12	4	5.44
Peg Lateral	8	5	3	2.72

Table 4: Relationship between gender and dental anomalies among the samples

	Gender	Mean	Std. Deviation	t-Value	p-Value
Impacted	Male	0.86	1.227	1.082	0.281
	Female	0.65	1.047		
Taurodontism	Male	0.07	0.474	1.339	0.183
	Female	---	---		
Dilaceration	Male	1.00	1.441	-1.312	0.192
	Female	1.31	1.479		
Microdont	Male	0.48	1.394	0.754	0.452
	Female	0.32	1.017		
Hypercementosis	Male	0.02	0.158	-0.754	0.452
	Female	0.05	0.335		
Distomolar	Male	0.05	0.220	0.680	0.497
	Female	0.02	0.167		
Fusion	Male	0.15	0.622	1.167	0.245
	Female	0.05	0.289		
Peg lateral	Male	0.06	0.333	0.410	0.682
	Female	0.04	0.265		

$p \leq 0.05$ – Significant, CI = 95 %