



Research Article

Prevalence, distribution, and clinical relevance of non-syndromic dental anomalies in the general population of Uttar Pradesh, India: A radiographic study

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Received : 14 June 2022

Accepted : 14 November 2022

Published : 26 June 2023

DOI

10.25259/JGOH_31_2022

Quick Response Code:



ABSTRACT

Objectives: The objective of the study was to learn about the incidence of dental defects in our area and to assist dental surgeons and patients in achieving a better treatment outcome.

Materials and Methods: Between March 2021 and March 2022, panoramic radiographs of 5140 patients attending the Department of Oral Medicine and Radiology, Subharti Dental College, Meerut, Uttar Pradesh, were examined, and this number of patients was included in the study based on the existence of dental anomalies. The participants in this study ranged in age from 8 to 60 years old. The study eliminated patients with syndromes linked to dental anomalies, and no clinically investigated dental malformations were included in the study. In patients visiting the hospital's dental outpatient department, assessment of the prevalence and distribution of dental anomalies (i.e., tooth-by-tooth distribution) was performed.

Results: Patients with dental malformations were discovered with the greatest proclivity for dilaceration (53.07%). Impacted mandibular teeth were the second most common anomaly found. Hypercementosis, dwarf roots, macrodontia, and microdontia were also found to be more prevalent.

Conclusion: In a non-syndromic adult Indian population of Uttar Pradesh, the prevalence and distribution of several developmental dental abnormalities were discovered. Impaction, hypercementosis, dwarf roots, hyperdontia, root dilaceration, peg-shaped laterals (microdontia), and hypodontia were more common than other size and shape anomalies. These anomalies have a considerable impact on tooth occlusion and alignment, which has an impact on orthodontic treatment planning. They aid in the diagnosis of various systemic disorders and syndromes, as well as surgical planning. If not addressed effectively, they may bring treatment challenges.

Keywords: Dental anomalies, Orthopantomogram, Maxillofacial radiology, Dilaceration, Impaction

INTRODUCTION

Oral and maxillofacial physicians encounter many abnormalities associated with the oral cavity from craniofacial anomalies to developmental anomalies of teeth. Developmental anomalies of teeth are a significant category of dental morphological variations. Their presence may result in disturbances of eruption timing, arch formation, and malocclusion of teeth.

The types of dental anomalies investigated and diagnostic criteria for each dental anomaly were different in the literature, showing inconsistent results. In addition, due to the differences in ethnicity and environmental factors, discrepancies existed in the

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prevalence of dental anomalies between various previous studies.

Panoramic radiographs are often utilized as they are well tolerated due to their non-invasive profile and deliver information not acquirable from clinical examination.

Some incidental findings, that is, periapical radiolucency when the patient has a different area of problem and can only be examined by X-rays, root resorptions, and idiopathic sclerosis can also be encountered while interpreting the X-ray image of the patient. Similarly, dental anomalies can also be discovered while interpreting the X-ray image and can aid patients in many aspects of treatment planning.

Teeth that are formed abnormally at the time of their development are the definition of dental anomalies. These can be visible clinically but sometimes need X-rays to interpret the type, size, and position of the anomaly. When compared to the most prevalent oral conditions, such as tooth decay and periodontal disease, they don't progress as quickly and occasionally need to be treated properly to avoid affecting other oral tissues.^[1]

Many genetic and non-genetic factors contribute to the development of such anomalies. They are usually asymptomatic but occasionally bring about complications in the patients and demand immediate treatment.

They are classified according to their (1) number which includes supernumerary teeth, or missing teeth, (2) size which includes macrodontia, microdontia, (3) eruption, that is, transposition, impaction, (4) altered morphology in which fusion, conrescence, gemination, taurodontism, dilaceration, dens invaginatus, dens evaginatus, enamel pearl, talon cusp and Turner's hypoplasia, and (5) acquired which includes hypercementosis.^[2]

Impaction of third molars is a crucial issue of concern these days, as called to be vestigial, the third molar generates inconvenience to its extreme while erupting in major populations and requires an immediate treatment plan. It is associated with pain, discomfort while eating and speaking, inflamed pericoronal tissue, that is, pericoronitis, and sometimes it also hampers the mouth opening of patients which mimics temporomandibular disc derangements-like symptoms.

One of the modalities which pose a convincing role in the treatment strategizing of impaction is radiology. An orthopantomogram (OPG) or cone-beam computed tomography imaging is required to rule out the position and extent of the bone it is embedded in. Sometimes these teeth are also not evident clinically and we might find such teeth during the interpretation of the radiographic image just like dental anomalies we have discussed earlier. Hence, our present study aims to determine the presence of dental anomalies while examining the panoramic radiographs in the population of Uttar Pradesh, Meerut.

MATERIALS AND METHODS

The panoramic radiographs of 5140 patients attending the Department of Oral Medicine and Radiology, Subharti Dental College, Meerut, Uttar Pradesh between March 2021 and March 2022 were examined and based on the presence of dental anomalies, we included this number of patients in the study. This study included the age group of 8–60 years. Patients with syndromes associated with dental anomalies were excluded from the study and no clinically examined dental anomalies were included in the study. We evaluated the prevalence and distribution, that is, tooth-wise distribution of dental anomalies in the patients who visited the dental outpatient department of the hospital.

RESULTS

One-year OPG data of the patient who reported to the Department of Oral Medicine and Radiology was collected and interpreted. The total number of OPGs evaluated was 5140. Among them 2080 (40.46%) patients with dental anomalies were uncovered with maximum inclination towards dilaceration (53.07%) as shown in [Table 1]. When compared maxillary premolars had the highest number of dilacerated roots which was followed by canine (because of their long roots) and maxillary third molars.

After dilaceration, the second most prominent anomaly observed was impacted mandibular teeth. Mandibular third molars had the highest incidence rate when compared to maxillary canines. Impacted maxillary and mandibular premolars had the lowest incidence.

The dental anomaly that was widely prevalent in western Uttar Pradesh was hypercementosis of roots (10.76%) [Table 1]. They were repeatedly found in the mandibular molars and no other tooth with hypercementosis was noticed in the OPGs.

Table 1: The number and percentage of the dental anomalies observed in the orthopantomograms of the patient in 1 year.

Anomalies	No. of anomalies found	% of Anomalies found
Dilaceration	1104	53.07
Impaction	820	39.42
Hypercementosis	224	10.76
Dwarf roots	76	3.65
Supernumerary teeth	52	2.5
Anodontia	40	1.92
Taurodontism	12	0.57
Microdontia	12	0.57
Macrodontia	8	0.38
Peg laterals	8	0.38
Gemination	4	0.19

Dwarf roots were noticed in the study and majority of times it was found in the anterior teeth of both maxilla and mandible where mandibular canine roots were the highest among all teeth.

Mesiodens and supernumerary teeth were also discovered and often seen in the anterior teeth of the maxilla. Apart from the above-mentioned, few other anomalies which were detected in the OPGs were anodontia, microdontia, taurodontism, peg laterals, macrodontia, and gemination [Table 1].

DISCUSSION

The developmental anomaly of the teeth is not an infrequent finding both clinically and radiographically. Oral physicians and maxillofacial radiologists should not only rely on clinical diagnosis but should consider radiographic diagnosis additionally. An ample range of prevalence of dental anomalies has been encountered in the literature. This study was conducted to reveal the prevalence of dental anomalies in western Uttar Pradesh, India using panoramic radiographs of the patients.

In our study, the incidence of dilaceration was the highest. Dilaceration is a disturbance in tooth formation that produces a sharp bend or curve in the tooth anywhere in the crown or the root. It is likely developmental in nature but some old concepts stated that it takes place due to mechanical trauma to the calcified portion of the partially formed tooth. ALHumaid *et al.* recently conducted a study on the prevalence of dental anomalies in the East Province of Saudi Arabia and concluded that dilaceration was the highest amongst all the anomalies they studied in their sample.^[3] They are difficult to comprehend from fused roots, and sclerosing osteitis.^[2] They generally do not require any treatment but if it is advised for the extraction, the removal can be intricate so the surgeon must plan his treatment accordingly.

Third molars are the most commonly impacted teeth, with an average worldwide rate of impaction of 24%.^[4] An impacted tooth is the one that is restricted from completely erupting into a normal functional position. This may be due to lack of space, obstruction by another tooth, or an abnormal eruption path. The treatment for the impacted teeth is surgical removal at best. In our study, 39.42% [Table 1] of impacted teeth were appreciated in the radiographs and there was no significant arch-wise side relation (right side or left side) found. Mello *et al.* reviewed in their literature that odontogenic cysts and tumors were found in 5.3% of impacted third molars which were extracted. The most common lesions were the radicular cyst, dentigerous cyst, and odontogenic keratocyst.^[5] There was a study conducted on the prevalence and pattern of third molars in Yemeni adults and this study found that about 40% of Yemeni adult patients ranging in age from 18 to 28 years had at least one impacted third molar.^[6]

Hypercementosis is excessive deposition of cementum on the tooth root the cause of which is unknown. It sometimes puts

in an appearance on a supraerupted tooth after the loss of the opposing tooth of the opposite arch. It is linked with teeth that are in hyperocclusion or fractured. It is often detected in Paget's disease of bone and with endocrinal disturbances like hyperpituitarism. There may be a resemblance to cementoblastoma. The prevalence of hypercementosis is quite excessive in the population of Western Uttar Pradesh. Patil *et al.* carried out a study on Saudi Arabian population and it had been determined that 4.82% of patients and 0.96% of teeth in a Saudi population have hypercementosis.^[7]

Supernumerary teeth are the teeth that develop in addition to the regular number of teeth as a result of excess dental lamina in the jaws. The tooth or teeth that develop may be morphologically normal or abnormal. When supernumerary teeth have normal morphologic features, the term supplemental is occasionally used. Supernumerary teeth that occur between the maxillary central incisors are defined as mesiodens, those that occur in the premolar area are peridens, and those that occur in the molar area are distodens.

They are found in 1–4% of the population, may have a high incidence in Asians and Native American, and indigenous populations, and occur twice as often in males.^[2] In our study, the incidence rate is not much [Table 1]. Singh *et al.* did an analysis of the North Malaysian population and found out the prevalence of supernumerary teeth in the non-syndromic Malaysian population is 1.05% with slight male predilection and mesiodens being the most common,^[8] whereas, in our study, 2.5% of supernumerary teeth were seen in 1 year [Table 1].

Short root anomalies were first discovered in 1972 by Lind, who perceived that the roots of maxillary central incisors were, in a few instances, so short that they must be anomalous. The roots were narrated to have a distinctive “plump” and “onion shape,” and were found to always influence the central incisors bilaterally.^[9] In our study, there was more involvement seen in the anterior teeth of the maxilla and mandible but there was seen participation of premolars and molars also.

Puranik *et al.* conducted a study on the characterization of short root anomaly (SRA) in a sample of Mexican population and concluded that SRA occurs more frequently in Latino individuals and has a predilection for anterior teeth. The occurrence of SRA in two families further confirms a hereditary component and supports a distinct nosology and nomenclature, hereditary idiopathic root malformation, and warrants further investigation.^[10] Discussing Dentinogenesis imperfecta I (DI-I) radiographically, the teeth are interpreted as bulbous crowns and constricted short roots. Short roots anomalies are also a peculiar feature of DI-I where a character name is given to such teeth as “shell teeth.”^[11]

In addition to developmentally missing teeth, there can also be several independent pathologies that can impair

the orderly formation of the dental lamina (e.g., orofacial-digital syndrome), failure of the tooth germ to develop at the optimal time, lack of necessary space imposed by a malformed jaw, or disproportion between tooth mass and jaw size. The condition is more common in Asians and Native Americans.^[2] Only 1.92% of the patients in our study were born with congenitally missing teeth [Table 1].

Odontogenesis and tumorigenesis may seem unrelated processes; however, their clinical association highlights the overlap of genetic determinants and molecular pathways. It should be considered a warning sign for adult neoplasms that tooth agenesis can be diagnosed in childhood. It is the responsibility of healthcare professionals to identify tooth agenesis and to provide the appropriate preventive guidance.^[12]

Taurodontism occurs when Hertwig's epithelial sheath diaphragm fails to invaginate at the proper horizontal level, causing a change in tooth shape. The pulp chamber is enlarged, the pulpal floor is displaced apically, and there is no constriction at the cemento-enamel junction.^[13] While the permanent molar teeth are most commonly affected, this change can occur unilaterally or bilaterally, in any combination of teeth or quadrants, in both the permanent and deciduous dentition. The term taurodontism comes from the Latin word *tauros* which means "bull" and the Greek word *odus* which means tooth or "bull tooth."

It was observed in our study that taurodontism is not frequently seen in the population of our region [Table 1]. A meta-analysis was done on the prevalence of taurodontism in recent humans and evolutionary perspectives and their study revealed that there is evidence that taurodontism still exists among modern humans, where selective advantages of high attrition diet still exist.^[14] A more detailed understanding of the evolutionary path of the trait could be reached by looking at the remains and recent populations of recent human generations and using standardized assessments. In patients with trisomy 21, taurodontism has been reported with a higher frequency.^[2]

Microdontia refers to teeth that are smaller than normal. Microdontia can affect all teeth, or it can involve just one tooth or a small group of teeth. The lateral incisors of microdents may be peg-shaped. It is also possible to consider microdent teeth as an indicator for syndromes (e.g., congenital heart disease and progeria).^[2] A cross-sectional study was conducted at Sindh Institute of Oral Health Sciences, and Microdontia was found to be a frequent dental anomaly, which was more prevalent in females and the maxilla.^[15]

A macrodontic condition is characterized by large teeth. It is unknown what causes macrodontia, which is often sporadic. The development of adjacent teeth can be accelerated by

vascular abnormalities, such as a hemangioma (arising from within the bone or soft tissues).^[2] In addition to macrodontia, hemihypertrophy of the face and pituitary gigantism can also lead to this condition.

The term "gemination" refers to the attempt of a tooth bud to divide. Often, this will result in an invagination of the crown and partial division or, more rarely, a complete division through the crown and root, creating identical structures. Enamel that is radiopaque accentuates clefts and invaginations in crowns. There is usually a single pulp chamber, which can be enlarged and partly divided. An image of the tooth suggests the presence of a molar with an enlarged crown and two roots in the rare case of premolar gemination.

Clinical relevance

We investigated the prevalence of dental malformations in various parts of the world, prompting the queries, "Why examine the prevalence?" and "What is the purpose of all this research on the prevalence of dental anomalies?"

Dental abnormalities can operate as a barrier to the patient's traditional therapy. For example, if the patient has a dilacerated root of that particular tooth and the dentist is unaware of this condition, he or she may perforate the root canal, resulting in cement leaking in the periapical region. The same applies to orthodontic treatment; if the patient's roots are dilacerated, movement will be difficult, and the force used may cause the tooth to shatter. Roslan *et al.* conducted a study on dental anomalies and their treatment modalities and they gave a clinical relevance that these irregularities have a significant impact on tooth occlusion and alignment, affecting orthodontic treatment planning and potentially resulting in treatment relapse if not addressed properly.^[16]

In our study, impaction was a prevalent dental deformity, and dentists should be aware of the complications that accompany it. We can rule out the initial phases of dentigerous cysts or pericoronitis by knowing the prevalence in the population. Impaction also creates the impression of temporomandibular joint disorders by restricting mouth opening and causing pain while opening the mouth.

Dentists must be well-versed in hypercementosis in the region in which they practice because there is excessive cementum deposition on the tooth roots, which can be confused with osseous dysplasia and cementoblastoma in panoramic images.

It is normal to be perplexed by short teeth or microdontia with the presence of retained deciduous teeth. Knowing the prevalence of microdents in your vicinity may help you avoid misdiagnosing microdents with deciduous teeth. There are already systemic diseases, and genetic diseases associated

with dental anomalies such as microdontia, congenital heart disease, and progeria that can then be ruled out in the population, leading to early diagnosis of such diseases.

Many general practitioners meet syndromic patients when it comes to interdisciplinary aspects of diagnosis, and some syndromes can be so convoluted that they are misdiagnosed with other diseases. Many syndromes are linked to dental anomalies; if we know how common dental anomalies are in our area, we may consult with doctors and diagnose those specific syndromes. Although we can treat the oral aspect of the patient, physicians can treat the systemic aspect.

There are numerous syndromes associated with dental anomalies like supernumerary teeth associated with cleidocranial dysplasia, Gardner syndromes, familial adenomatous polyposis, Rubinstein Tayabi syndrome, Nance Horan syndrome, Opitz G/BBB syndrome, oculofaciocardiodental syndrome, and autosomal dominant Robinow syndrome.^[17] Similarly, taurodontism is associated with Klinefelter's syndrome, trichodontoosseous syndrome, otodontal dysplasia, Witkop syndrome, focal dermal hypoplasia syndrome, X chromosomal aneuploidy, and Down syndrome.^[18] We can detect these diseases to some extent provided, we know how they are interrelated to dental deformities.

CONCLUSION

In a non-syndromic adult Indian population of Uttar Pradesh, the prevalence and distribution of several developmental dental abnormalities were discovered. Impaction, hypercementosis, dwarf roots, hyperdontia, root dilaceration, peg-shaped laterals (microdontia), and hypodontia were more common than other size and shape anomalies

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Patil S, Doni B, Kaswan S, Rahman F. Prevalence of dental anomalies in Indian population. *J Clin Exp Dent* 2013;5:e183-6.
2. White SC, Pharoah MJ. *White and Pharoah's Oral Radiology: Principles and Interpretation*. Netherlands: Elsevier Health Sciences; 2018.
3. ALHumaid J, Buholayka M, Thapasum A, Alhareky M,

Abdelsalam M, Bughsan A. Investigating prevalence of dental anomalies in Eastern province of Saudi Arabia through digital orthopantomogram. *Saudi J Biol Sci* 2021;28:2900-6.

4. Ryalat S, AlRyalat SA, Kassob Z, Hassona Y, Al-Shayyab MH, Sawair F. Impaction of lower third molars and their association with age: Radiological perspectives. *BMC Oral Health* 2018;18:58.
5. Mello FW, Melo G, Kammer PV, Speight PM, Rivero ER. Prevalence of odontogenic cysts and tumors associated with impacted third molars: A systematic review and meta-analysis. *J Craniomaxillofac Surg* 2019;47:996-1002.
6. Alhadi Y, Al-Shamahy HA, Aldilami A, Al-Hamzy M, Al-Haddad KA, Shaalan M. Prevalence and pattern of third molar impaction in sample of Yemeni adults. *On J Dent Oral Health* 2019;1:1-4.
7. Patil SR, Araki K, Yadav N, Ghani HA. Prevalence of hypercementosis in a Saudi Arabian population: A cone beam computed tomography study. *J Oral Res* 2018;7:94-7.
8. Singh S, Gupta K, Kumaresan R, Pendalya SK, Kondreddy K, Karthikeyan P. Prevalence of supernumerary teeth in non-syndromic northern Malaysian population. *EAS J Dent Oral Med* 2019;1:58-61.
9. Choong C. *Genetics of Short Root Anomalies (Doctoral Dissertation)*. USA: The University of Michigan;2022.
10. Puranik CP, Hill A, Jeffries KH, Harrell SN, Taylor RW, Frazier-Bowers SA. Characterization of short root anomaly in a Mexican cohort--hereditary idiopathic root malformation. *Orthod Craniofac Res* 2015;18 Suppl 1:62-70.
11. Subramaniam P, Mathew S, Sugnani SN. Dentinogenesis imperfecta: A case report. *J Indian Soc Pedod Prev Dent* 2008;26:85-7.
12. Ritwik P, Patterson KK. Diagnosis of tooth agenesis in childhood and risk for neoplasms in adulthood. *Ochsner J* 2018;18:345-50.
13. Jafarzadeh H, Azarpazhooh A, Mayhall JT. Taurodontism: A review of the condition and endodontic treatment challenges. *Int Endod J* 2008;41:375-88.
14. Decaup PH, Couture C, Colin M, Garot E. Prevalence of Taurodontism: Meta-analysis in Recent Humans and Evolutionary Perspectives. *Homo: Internationale Zeitschrift fur die Vergleichende Forschung Am Menschen*; 2021.
15. Khan EB, Fatima S, Rafi SM, Shah M, Ahmed HZ. Prevalence of microdontia among patients undergoing orthodontic treatment. *Age* 2020;77:72-6.
16. Roslan AA, Rahman NA, Alam MK. Dental anomalies and their treatment modalities/planning in orthodontic patients. *J Orthod Sci* 2018;7:16.
17. Lubinsky M, Kantaputra PN. Syndromes with supernumerary teeth. *Am J Med Genet A* 2016;170:2611-6.
18. Rao A, Arathi R. Taurodontism of deciduous and permanent molars: Report of two cases. *J Indian Soc Pedod Prev Dent* 2006;24:42-4.

How to cite this article: Panwar A, Kamarthi N, Sharma S, Malik S, Goel S, Gupta S, *et al.* Prevalence, distribution, and clinical relevance of non-syndromic dental anomalies in the general population of Uttar Pradesh, India: A radiographic study. *J Global Oral Health* 2023;6:30-4.