



Prevalence of Dental Anomalies Among the Pediatric Population at Abbasi Shaheed Hospital, Karachi, Pakistan: A Cross-Sectional Survey

Maryam Zafar^{1*}, Aiman Sheikh¹, and Maliha Mohsin¹

1. Department of Oral and Maxillofacial Surgery, Abbasi Shaheed Hospital, North Nazimabad, Karachi, Pakistan

*Correspondence: drmaryamzafar@gmail.com

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Significance: This research holds significant importance as it sheds light on prevalent dental anomalies in society, determining the optimal age for treatment and educating parents to mitigate further damage to teeth. Continuous research efforts not only enhance hospitals' and dentists' understanding but also refine their treatment approaches, ultimately leading to improved dental care outcomes.

Abstract:

Background: Pediatric dental anomalies refer to irregularities or abnormalities in the development, structure, or positioning of the teeth in the oral cavity of children. These anomalies can encompass a wide range of conditions that affect the number, size, shape, and structure of teeth. In Karachi, there is limited evidence regarding the prevalence of dental anomalies in children.

Objective: This study investigated the prevalence of dental anomalies in the pediatric population of the Abbasi Shaheed Hospital, Karachi, Pakistan.

Material and Methods: A cross-sectional study was conducted among 278 children aged between 3 and 12 years. The socio-demographic and thorough medical history were recorded on a predesigned performa. The diagnosis of all dental anomalies was based on clinical interpretation using sterilized mouth mirrors, probes, or tongue depressors. Difficult cases were addressed by senior faculty members. Data analysis was conducted using SPSS version 19. Descriptive statistics were used to present the frequency and Mean \pm SD.

Result: The prevalence of dental anomalies was 7.4% in the study area. Male-to-female ratio was 2.2:1. Boys exhibited a higher prevalence of 10.05% compared to girls (4.3%). Peg Lateral Incisors and Fusion/Gemination were the most common anomalies among both genders. Dilaceration, Dentinogenesis Imperfecta, Amelogenesis Imperfecta, Talon Cusp, Anodontia, and supernumerary Tooth (disto-molar) were not identified in either boys or girls. The highest number of dental anomalies was recorded at ages 11 and 12 years.

Conclusion: The prevalence of dental anomalies was high in the study area, underscoring the significance of early diagnosis and careful management to prevent complications.

Introduction:

The tooth is a specialized part of the human body, understanding the development of which is enigmatic and still challenging. The successful development of tooth depends on a complex reciprocal interaction between the dental epithelium and underlying ecto-

mesenchyme (1,2). The interaction involves a complex series of molecular signals, receptors and transcription control systems

An **anomaly** is defined as something that is noticeably different or that deviates from the ordinary or normal. Dental anomalies are deviations of dental tissue origin and therefore are derived from the dental tissues enamel, dentin, or cementum. Anomalies can be extreme variations or just slight deviations. They can be caused by a multitude of things or by just one small variation in the environment (3,4).

Some abnormalities result from intrinsic factors such as heredity, metabolic dysfunction, or mutations; other causes are extrinsic such as physical or chemical trauma, biologic agents, nutritional deficiencies, stress, habits, or environmental conditions. In many instances anomalies result from a combination of intrinsic and extrinsic factors (5,6). If a condition occurs because of an individual's genetic makeup, the condition is termed hereditary. If the condition occurs at or before birth, it is termed congenital. A congenital condition is sometimes the result of heredity, and sometimes a hereditary condition does not become evident until years after birth (7). If a condition exhibits some evidence of an inherited tendency but such evidence is inconclusive, it is often referred to as a familial tendency. If a condition results during the formation and development of a dental structure, it is referred to as a developmental anomaly (8).

When talking about oral examination in children, we do not refer only to the teeth examination, caries discovery and prevention or to the talks with the parents regarding the child's diet or dental hygiene, but we also refer to the examination of the soft and hard structures of the oral cavity (9,10). These anomalies not only affect the esthetic appearance of teeth but also pose difficulties during dental treatment and sometimes are the cause of dental problems. The present study was performed to evaluate the frequency of occurrence of dental anomalies of size, number, and shape in the adult population and their implications in the treatment of such conditions (11).

This anomaly can be simply an isolated defect or can be associated with various syndromes. Compared to other common diseases and disorders of the oral cavity, such as dental caries and periodontal diseases, dental anomalies are less common; however, their treatment and control is often associated with difficulty and complexity. These disorders can cause malocclusion, beauty challenges, and can make root canal therapy or tooth extraction difficult. Morphological anomalies such as dilacerations, taurodontism, fusion, germination, and dens invagination, in addition to the impact on the person's appearance, could influence the root canal system

(12). Hence, successful endodontic treatment requires careful and special attention to their unusual anatomy. Anomalies in the number and position of teeth in the jaws are associated with beauty and occlusion-related challenges (13,14). Data on dental anomalies are important for both the anthropological and clinical management of patients. The incidence and degree of expression of the anomalies can provide important information for phylogenetic and genetic studies and help in the understanding of differences within and between populations. No study has been found describing the prevalence of dental anomalies among pediatric population reporting to Abbasi Shaheed Hospital, Karachi, Pakistan. Due to scant availability of data on the subject, rationale of our study is to find out frequency of dental anomalies in pediatric population in patients reporting to Abbasi Shaheed Hospital, Karachi, Pakistan.

Material and Methods:

Study Area and Period:

This cross-sectional study was conducted in pediatric OPD at Abbasi Shaheed Hospital, Karachi, Pakistan, from February to July 2023. Abbasi Shaheed Hospital, situated in Karachi, Pakistan's most populous city, operates as a tertiary care center within the public sector. Karachi, with a population of 20 million, is segmented into five districts, and Abbasi

Shaheed Hospital attends to hailing patients from three of these districts.

Population and Sample Size

The study population comprised 278 children aged 3-12 years, of both sexes, living in Karachi. The sample size was calculated using Raosoft software, an online tool, based on the following assumptions: a confidence level of 95%, a marginal error of 5%, and a non-response rate of 10%. Convenience sampling was employed to select participants. The inclusion criteria for the children were aged 3-12 years old and syndromic patients. The study did not include children who could not give their assent, or whose parents or guardians refused to consent to their inclusion.

Data Collection:

After obtaining informed verbal consent from the patient or their parent or legal guardian, demographics and medical history were recorded on a predesigned performa. Clinical examinations were performed to assess the presence of dental anomalies. The diagnosis of all dental anomalies was based on clinical interpretation using sterilized mouth mirrors, probes, or tongue depressors. Difficult cases were addressed by senior faculty members. The operational definitions of the variables are presented in Table 1.

Table 1: Variables and Operational Definition

Variables	Operational Definition (15)
Peg-shaped Incisor	Any maxillary lateral incisor characterized by reduced mesiodistal and cervico-incisal diameters
Mesio-dens	Supernumerary tooth developing between two maxillary incisors
Microdontia	Teeth which are smaller than their usual size
Macrodontia	Teeth which are larger than their usual size
Hypodontia	congenital absence of teeth
Anodontia	Complete absence of one or more dentitions
Talon's cusp	Extra cusp like tubercle originating from the palatal cingulum of maxillary lateral incisors
Fusion	Union between dentine and enamel of two or more separate developing teeth
Gemination	Partial development of two teeth from a single tooth bud following incomplete division
Supernumerary tooth	Additional tooth to the normal series but not resembling morphologically to any normal tooth
Supplemental tooth	Additional tooth to normal series resembling morphologically with the associated tooth
Amelogenesis imperfecta	Group of hereditary disorders affecting enamel formation
Dentinogenesis imperfecta	Group of hereditary disorder producing opalescent dentin

Statistical Analysis:

Data analysis was conducted using SPSS version 19. Descriptive statistics were used to present the

frequency and Mean \pm SD. Tables were used to present the data.

Results:

Two hundred and seventy-eight children participated in this study between ages 3-12 years. The ratio of male to female was 2.2:1. Fig-1

Of 278 children, 7.4% displayed anomalies.

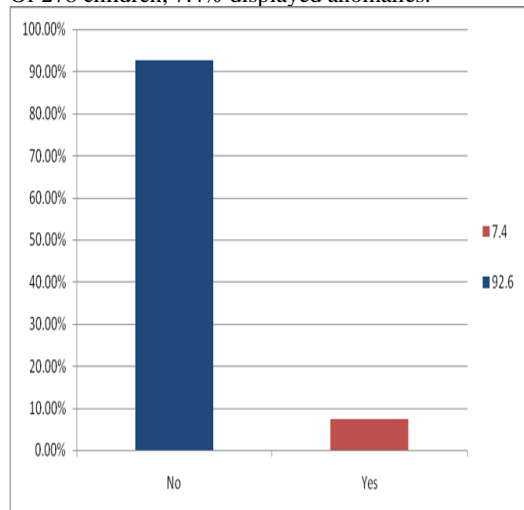


Figure 1 Bar graph showing the presence of dental anomalies in the pediatric population.

Table 1. Dental anomalies with respect to sex (percentage).

Anomalies	Male	Female
AI (Amelogenesis Imperfecta)	0.50%	0.00%
Fusion/Gemination	2.05%	1.25%
Hypodontia	1.50%	1.25%
Macrodontia	1.53%	0.00%
Microdontia	1.01%	0.00%
Peg Lateral	2.57%	1.25%
Supernumerary teeth (mesiodens)	0.50%	0.62%
Supernumerary teeth (paramolar)	0.50%	0.00%

Table-1: In terms of gender, the study revealed that dental anomalies were present in 10.05% of boys and 4.3% of girls. The prevalence of the most commonly found dental anomalies did not differ between boys and girls. Peg Lateral Incisors and Fusion/Gemination were equally common among both genders. Several other dental anomalies, including Dilaceration, Dentinogenesis Imperfecta, Amelogenesis Imperfecta, Talon Cusp, Anodontia, and supernumerary Tooth (distomolar), were reported with no occurrences in both the boys and girls.

Table-2: The highest number of dental anomalies were recorded at age 11 and 12 years with Peg Lateral and Fusion/Gemination. Similar to gender cases, several other dental anomalies, including Anodontia, Dentinogenesis Imperfecta, Dilaceration, Talon Cusp, and supernumerary Tooth (distomolar), were not reported at any age among the children.

Table 2: Dental anomalies with respect to age (in percentage).

Anomalies	Age (in years)	Percentage
AI (Amelogenesis Imperfecta)	9yrs	2.50%
Fusion/Gemination	11 yrs	13.30%
Hypodontia	2yrs	8.69%
Macrodontia	6yrs	2.43%
Microdontia	8yrs	2.70%
Peg Lateral	12yrs	14.28%
Supernumerary teeth (mesiodens)	8yrs	2.63%
Supernumerary teeth (paramolar)	11 yrs	5.88%

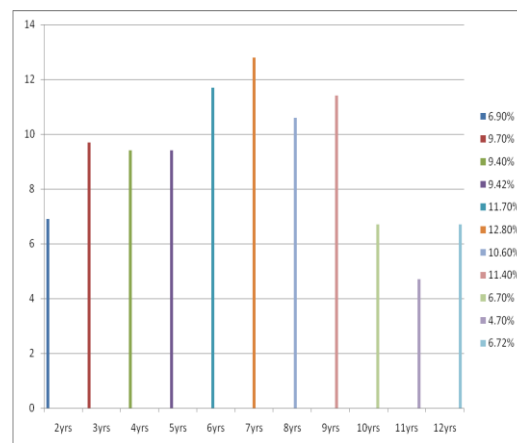


Figure 2: A bar graph showing presence of Anomalies with respect to age in percentage.

Discussion:

Dental developmental anatomical variants, whether structural or morphological, are most often associated with oral health problems. Developmental alterations of teeth manifest in various forms, including a number (hypodontia and hyperdontia), size (microdontia and macrodontia), shape (gemination, fusion, concrescence, accessory cusps, dens invaginatus, ectopic enamel, taurodontism, hypercementosis, accessory roots, dilaceration), and structure (amelogenesis imperfecta, dentinogenesis imperfecta, dentin dysplasia, regional odontodysplasia). Developmental dental anomalies can arise due to genetic or environmental factors or a combination of both, and they may be observed as an evolutionary trend (16).

During seemingly routine check-ups, dental practitioners must remain vigilant for "quiescent" abnormalities or irregularities. Knowledge of specific

issues prevalent within a particular patient population proves invaluable to practitioners when assessing individual patients. Numerous studies have focused on evaluating the pediatric population (17). Typically, anomalies in dental development are identified through routine clinical examinations and periapical and/or panoramic radiographic exams. Diagnosing these anomalies, conducted at the onset of the mixed dentition around 6 years of age, enables dental surgeons to adopt a preventive approach to potential esthetic and functional issues that may arise in the future within the normal developmental pattern. Early diagnosis is advantageous for promoting normal occlusion, as it allows for the planned eruption of permanent teeth.

Our study aimed to assess the prevalence of dental anomalies in children and adolescents, conducting a clinical-radiographical descriptive, cross-sectional study on young patients. Analyzing 278 records of individuals aged 3-12 years, we found that 7.4% of the population exhibited dental anomalies, while 92.6% had no such anomalies. Among the total anomalies, a higher percentage was observed in males (10.05%) compared to females (4.3%). The highest number of anomalies was reported in children aged 7 years, followed by 9 and 11 years, respectively.

Among the vast variations in anomalies concerning number, size, and shape, the most prevalent one in our conducted study was Peg Lateral Incisors, characterized by a reduction in mesiodistal and cervico-incisal width in most commonly maxillary lateral incisors. The prevalence of Peg Lateral Incisors was reported to be 2.57% in males and 1.25% in females in our study, most commonly observed at around 14.28% in (Group C) 12 years of age. A similar study conducted in the Odisha population in 2013 reported that anomalies, specifically Peg-shaped lateral Incisors, were found in 2.82% of the population (18).

In our study found a total incidence of fusion to be 2.05% in males and 1.25% in females, accounting for a total of 13.30% of the population, with the majority observed in the age group of 11 years. However, a study conducted in the Southeast Iranian Population in 2016 reported a fusion incidence of 0.09% in the population (19). Discrepancies in fusion rates may stem from regional variations or time disparities in data collection.

Many children visit the pediatric outpatient department daily, reporting various complaints related to malocclusions. One of the contributing factors to malocclusion is Macrodonia or Microdonia, which can disrupt the entire occlusion. Macrodonia refers to a tooth that is larger than its usual size, while Microdonia describes a tooth that is smaller in the oral cavity than its usual size. A study focused on tooth size anomalies in the Indian population, investigating the prevalence of size and number discrepancies, reported Macrodonia at 0.05% in females, with no cases reported in males (20). In contrast, our study revealed an incidence of

Macrodonia at 1.53% in males, with no cases found in females. Additionally, 2.43% of the population presented with Macrodonia in children at 6 years of age, and 2.70% of the population at around 8 years were found to have Microdonia in the oral cavity, of which 1.01% were females, and no males were reported with this anomaly.

The prevalence of hypodontia, excluding third molars, was found to be 11.3% in a study investigating hypodontia as a clinically relevant dental anomaly. The most frequently absent teeth were the mandibular second premolars (44.2%), followed by the mandibular lateral incisors (36.6%), and the maxillary second premolars (34.0%). In both sexes, 86.0% of patients with hypodontia were found to be missing one or two teeth (21). However, in our study, 8.69% of the population exhibited hypodontia around the age of 9 years, with 1.50% being males and 1.25% females.

A study evaluated the radiological and clinical findings of non-syndromic individuals with multiple (five or more) supernumerary teeth, where all patients were male, and the majority of multiple supernumerary teeth were observed in the premolar region. The prevalence of multiple supernumerary teeth in this study was reported to be 0.06% (22). In our study, we found a prevalence of 0.50% in males and 0.62% in females for Supernumerary Teeth. Additionally, about 2.63% of children aged 8 years were reported to have mesiodens, and 5.88% of the population reported having paramolars, with no cases reported for distomolars.

Several dental anomalies, including Dilaceration, Dentinogenesis Imperfecta, Amelogenesis Imperfecta, Talon Cusp, Anodontia, and supernumerary Tooth (distomolar), were reported with no cases in both the male and female population. The observation of a high prevalence of dental anomalies in the studied population emphasizes the importance of epidemiologic research to recognize the occurrence and characteristics of these lesions in young patients, aiming to enhance the knowledge of Dental Surgeons. It is crucial for dental practitioners to be able to diagnose and treat such anomalies. The incidence and association of number and size developmental dental anomalies vary significantly within the population. An awareness of the various anomalies and their distribution among different genders and age groups is essential for all dental practitioners to ensure timely and effective management (23).

Conclusion:

Dental anomalies can contribute to oral health problems and are a significant factor in the development of malocclusion if not diagnosed and treated promptly. Early diagnosis and careful management are crucial to prevent complications. It is important to be mindful of the prevalence of dental anomalies, emphasizing the need for children to undergo regular checkups to ensure timely identification and intervention.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Contributions: All authors made substantial contributions to the research that led to the creation of the submitted manuscript.

Ethics Approval and Consent to Participate:

This study was conducted in accordance with the guidelines outlined in the Declaration of Helsinki. Ethical clearance was obtained from the Karachi Medical and Dental College, and informed consent was secured from all parents/guardians involved in the study. The published data is entirely de-identified, and the manuscript does not include any specifics that could identify individuals.

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