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Prevalence of Dental Anomalies in an Orthodontic Population in Lagos, Nigeria

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Abstract

Context: Dental anomalies are developmental irregularities in the number, size, shape, position, or structure of teeth. Their prevalence varies across populations and can significantly affect orthodontic treatment planning. While such anomalies are well-documented in many regions, limited data exist on their radiographic prevalence in Nigerian orthodontic populations.
Objective: To determine the prevalence and distribution of dental anomalies in an orthodontic population in Lagos, Nigeria, using orthopantomogram (OPG) radiographs, and to assess associations with gender and arch location.
Materials and Methods: This retrospective cross-sectional study analyzed 662 orthodontic patient records from a private dental clinic in Lagos over a 12-month period. Only patients with complete diagnostic records, including OPGs, were included. Two calibrated examiners assessed anomalies radiographically. Anomalies were categorized into types based on number, size, shape/structure, and position. Descriptive statistics, chi-square tests, and Fisher's exact tests were utilized to analyze associations.
Results: Dental anomalies were present in 49.4% of patients. The most prevalent anomaly was impaction (40.2%), followed by dilaceration (5.3%), talon cusp (2.9%), and hypodontia (2.1%). Arch distribution revealed that the lower arch was most commonly affected (34.6%), and anomalies in both arches were present in 8.3% of cases. Impactions and microdontia showed statistically significant arch associations ($p < 0.001$). No statistically significant gender differences were observed.
Conclusion: Nearly half of the orthodontic patients in this Lagos-based sample exhibited at least one dental anomaly, with impactions being predominant. These findings underscore the need for early radiographic screening and anomaly-based treatment planning in Nigerian orthodontic practice.

Keywords: Dental anomalies, orthodontic population, Nigeria, Orthopantomogram, impaction, hypodontia

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Introduction

Dental anomalies are developmental irregularities in the number, size, position, or structure of teeth. They result from disturbances during tooth development (odontogenesis) caused by genetic mutations and environmental influences in prenatal or postnatal periods.[1] These anomalies can lead to functional issues, aesthetic concerns, and occlusal problems, often complicating orthodontic diagnosis and treatment planning. For example, an extra tooth or a congenitally missing tooth may alter the dental arch length and occlusion, contributing to malocclusion that requires orthodontic intervention.[2] Therefore, recognising and addressing dental anomalies is crucial in orthodontics to ensure comprehensive treatment planning and to anticipate potential challenges in tooth alignment. Early detection and management of such anomalies can reduce treatment complexity and prevent future complications.[3]

Dental anomalies encompass a broad spectrum of conditions and can be classified by their nature into anomalies of number, size, shape, position, or structure. Examples include tooth agenesis (hypodontia, i.e. congenitally missing teeth) and supernumerary teeth (hyperdontia) which are anomalies of number, tooth size discrepancies such as microdontia (tiny teeth, e.g. peg-shaped lateral incisors) or macrodontia (unusually large teeth), and abnormal tooth shape or structure such as taurodontism (enlarged pulp chambers in molars), dilaceration (abnormal angulation of a tooth root), dens invaginatus ("tooth within a tooth"), or enamel hypoplasia.[1,2] Positional and eruptive anomalies are also common, notably tooth impactions (failure of a tooth to erupt into the arch, as often seen with canines or premolars) and transpositions (interchanged positions of two adjacent teeth). Some of these anomalies may occur in isolation, while others can co-occur or be part of syndromes. Each type can have specific implications for oral function and treatment. For instance, an impacted canine can disrupt the eruption sequence and cause malalignment, while a peg-shaped incisor creates spacing and aesthetic concerns that complicate smile design. Anomalies such as supernumerary teeth or transpositions not only present cosmetic and functional challenges but are also known causal factors in malocclusion, dental caries, and periodontal problems. Such issues underscore the importance of a thorough dental evaluation, which includes screening for any dental anomalies.

Studies worldwide report highly variable prevalence of dental anomalies detectable on orthopantomogram (OPG) radiographs, ranging from under 20% to well over 50% of the population.3 This variability is due to differences in population genetics, age ranges, and criteria (e.g. whether third molar issues or minor anomalies are included).

In an Italian study of 8–12-year-old children (non-orthodontic), 20.9% had at least one developmental dental anomaly on panoramic X-ray. The most frequent were maxillary canine displacement (7.5%) and hypodontia (missing teeth, 7.1%) .[4] By contrast, a radiographic survey in Eastern Saudi Arabia (mixed-age patients 7–65) found 36.3% had developmental anomalies, with root dilacerations (30.2%) and congenitally missing teeth (23.3%) being the most common findings. Even higher rates have been noted in some South American populations – e.g., a Brazilian study reported an anomaly prevalence of approximately 56.9%. These disparities underscore the impact of ethnicity and diagnostic definitions on reported rates.[3]

The inclusion of third molar impactions or agenesis significantly increases the overall prevalence. For instance, an extensive Indian study (Chennai, ages 20–40) reported that only 14.5% of adults had no anomaly, meaning ~85.5% had at least one, mainly due to the very high frequency of impacted third molars (28% of patients). If third molar anomalies are excluded, the prevalence in such populations is much lower, underscoring the need for consistent criteria when comparing studies.[6]

The prevalence of dental anomalies in populations has been widely studied, and results show considerable variation globally. Worldwide, reported prevalence rates range from approximately 5% to about 40% in the general population, with some studies even reporting that over half of individuals are affected when a broad range of anomalies is considered.[2] For example, epidemiological surveys have found dental anomalies in approximately 36.3% of examined individuals in Saudi Arabia and as high as 56.9% in Brazil. In contrast, the rate in the Iranian population was about 18.2%.[7,8] These differences reflect the influence of racial genetic backgrounds, environmental factors, and differing diagnostic criteria across studies. Notably, dental anomalies tend to be more frequent in orthodontic patient groups than in general dental patients. Malocclusions often have underlying contributions from anomalies (such as missing or extra teeth), which means patients presenting for orthodontic care are a select population where anomalies are over-represented. For instance, a study in Yemen reported that 30.6% of patients seeking orthodontic treatment had at least one dental anomaly (compared to ~23% of non-orthodontic dental patients). Similarly, a study in Croatia found that 24.1% of orthodontic patients had at least one developmental dental anomaly; within this group, hypodontia (7.5% of patients) was the most common specific anomaly identified, followed by tooth impactions (6.3%).7 Tooth agenesis (hypodontia) is frequently cited as one of the most common dental anomalies overall, with prevalence in general populations reported around 5–10% (depending on whether third molars are counted). By contrast, hyperdontia (supernumerary teeth) is less common, affecting approximately 0.8–3% of people worldwide; however, it is significant in orthodontics when extra teeth cause crowding or impaction of adjacent teeth. Microdontia has a reported occurrence of approximately 2–3% in the general population; for example, peg-shaped lateral incisors were found in approximately 0.9% of individuals in a Nigerian sample.3 Other anomalies like taurodontism or dilaceration are relatively rarer individually (often only around 1% or less in prevalence), but certain populations or imaging-based studies have noted taurodontism as a frequent incidental finding in molars.4 Overall, this illustrates that a substantial minority of patients may present with dental anomalies, especially in an orthodontic context, and multiple anomalies can co-occur in the same patient.

This study, therefore, aims to investigate the prevalence of dental anomalies in an orthodontic patient population in Lagos, Nigeria. The study seeks to identify and classify the types of dental anomalies present, determine the frequency and distribution of each anomaly, and analyze their associations with factors such as gender and location (Maxillary or Mandibular).

Materials and Methods

This study was conducted at a private dental clinic in Lagos, Nigeria, with the aim of investigating the radiographic prevalence and pattern of dental anomalies in an orthodontic patient population. Using a retrospective descriptive cross-sectional design, the study reviewed clinical and panoramic radiographic records (orthopantomograms, OPGs) from patients who attended the clinic for orthodontic consultation or treatment over a 12-month period. This design allowed for the estimation of prevalence and the identification of patterns of dental anomalies within a defined timeframe, using existing records. The study population included all patients who presented to the orthodontic clinic during the specified year. These included children, adolescents, and adults who sought orthodontic care and had complete diagnostic records from their initial visit. To ensure data quality, only patients with full orthodontic documentation (particularly a panoramic radiograph) were included. Records that lacked critical diagnostic information, such as missing OPGs or incomplete charting, were excluded. Additionally, patients with syndromic conditions or craniofacial anomalies that might introduce confounding developmental features were excluded from the main analysis, although their data were noted separately. As the study aimed to capture all eligible patients seen during the year, a total population sampling approach was employed. A total of 662 patient records were included.

Data collection was carried out using a structured data extraction form designed specifically for the study. For each patient, demographic details such as age and sex were recorded, along with detailed information on the presence and classification of any dental anomaly detected radiographically. The anomalies were grouped into categories such as anomalies of number (e.g., hypodontia, hyperdontia), size (e.g., microdontia, macrodontia), shape or structure (e.g., dilaceration, taurodontism, peg-shaped teeth), and position (e.g., impaction, transposition). Where applicable, the specific teeth affected were documented. Two calibrated examiners independently assessed each OPG and patient record to ensure consistency in identifying and classifying anomalies. The extracted data were then entered into a secure electronic database for statistical analysis.

Data analysis was performed using IBM SPSS Statistics (version 25.0) and R statistical software. Descriptive statistics were used to calculate the overall prevalence of dental anomalies and the frequency of each anomaly type. Distribution by arch (maxilla vs. mandible), tooth location, and demographic categories was also analyzed. Chi-square tests and Fisher's exact test were employed to assess associations between anomalies and patient sex or age group, where appropriate. All tests were with a significance threshold set at $p < 0.05$, and results were reported with appropriate summary tables and graphs for clarity. Ethical approval for the study was obtained from the Health Research Ethics Committee of Lagos University Teaching Hospital (LUTH).

Results

A total of 662 orthodontic patient records were reviewed in this study. The ages of the study population range from 12 to 90 years, with the median age of the patients being 33.08 years, with an interquartile range (IQR) of 23.65 to 39.39 years, indicating that the majority of patients were young to middle-aged adults. The most represented age group was 30–39 years, accounting for 35.3% of the study population, followed by the 20–29 age group (25.7%) and the 40–49 group (14.2%). Adolescents aged 12–19 years comprised 13.6% of the sample, while those aged 50 years and above represented 11.2%.

In terms of gender distribution, there was a slight male predominance, with 53.0% of the patients being male (n = 351) and 47.0% female (n = 311). Overall, the data reflect a demographically diverse orthodontic patient population with a broad age range and a near-balanced gender distribution. [Table 1]

Out of the 662 orthodontic patient records reviewed, 327 individuals (49.4%) were found to have at least one radiographically detectable dental anomaly, while 335 patients (50.6%) presented with no anomalies. Regarding the anatomical location of these anomalies, the lower arch was most frequently affected, with 34.6% of the total population exhibiting anomalies confined to the mandible. Anomalies involving both arches were observed in 8.3% of patients, while 5.6% had anomalies limited to the upper arch. Just over half of the patients (51.5%) had no anomalies recorded in either arch.

The most prevalent anomaly identified was impaction, occurring in 266 patients (40.2%), which constitutes the vast majority of anomaly cases in this population, with the highest prevalence in molars at 38.2%, followed by 0.6% in premolars, 0.3% in canines, and minimal figures for anterior teeth (incisors at 0.15%) [Figure 3]. This was followed by dilaceration in 5.3% and talon cusp in 2.9% of patients. Dilaceration is most commonly observed in molars (5.6%), followed by premolars (1.6%), canines (1.3%), and a low frequency in incisors (0.3%). Peg-shaped teeth appear exclusively in lateral incisors (2%). Talon cusp shows a wide spread, affecting 2% of central incisors, 1.3% of lateral incisors, and 1.6% of canines. [Figure 3]

Hypodontia was observed in 2.1%, while anomalies such as microdontia, taurodontism, and peg-shaped

Table 1: Sociodemographic characteristics of study population

Variable	N = 662¹
Age [median (interquartile range)], in years	33.08 (23.65, 39.39)
Age Group	
12–19	90.0 (13.6%)
20–29	170.0 (25.7%)
30–39	234.0 (35.3%)
40–49	94.0 (14.2%)
≥50	74.0 (11.2%)
Gender	
Female	311.0 (47.0%)
Male	351.0 (53.0%)

¹Median (Q1, Q3); n (%)

Table 2: Prevalence of Anomalies in the study population

Variable	N = 662¹
Anomaly Present	
Yes	327.0 (49.4%)
No	335.0 (50.6%)
Location of Anomaly	
Upper Arch	37.0 (5.6%)
Lower Arch	229.0 (34.6%)
Both Arches	55.0 (8.3%)
None	341.0 (51.5%)
Hypodontia	14.0 (2.1%)
Supernumerary Teeth	1.0 (0.2%)
Paramolar	6.0 (0.9%)
Distomolar	3.0 (0.5%)
Macrodontia	3.0 (0.5%)
Microdontia	10.0 (1.5%)
Dilaceration	35.0 (5.3%)
Fusion	0.0 (0.0%)
Taurodontism	10.0 (1.5%)
Peg Shaped	10.0 (1.5%)
Bifid Roots	1.0 (0.2%)
Talon Cusp	19.0 (2.9%)
Dens Invaginatus	1.0 (0.2%)
Dentinogenesis Imperfecta	0.0 (0.0%)
Amelogenesis Imperfecta	0.0 (0.0%)
Dentin Dysplasia	0.0 (0.0%)
Hypercementosis	6.0 (0.9%)
Odontodysplasia	0.0 (0.0%)
Odontome	5.0 (0.8%)
Impaction	266.0 (40.2%)
Ectopic Eruption	2.0 (0.3%)
Inversion	0.0 (0.0%)
Transposition	1.0 (0.2%)

¹n (%)

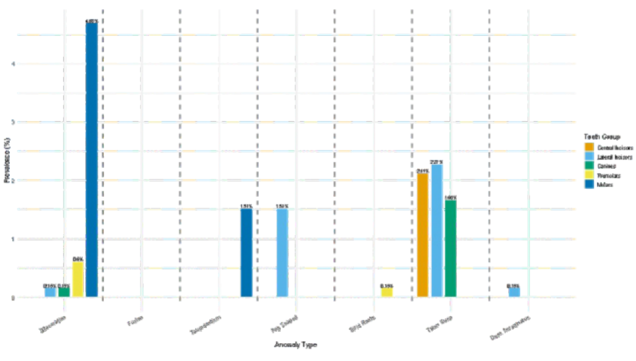

Figure 1: Prevalence of Dental Anomalies of Shape/Form

Table 3: Association between anomalies and gender in the study population

Number Anomalies	Overall N = 662[1]	Female N = 311[1]	Male N = 351[1]	p-value[2]
Hypodontia				0.2
Yes	14.0 (2.1%)	4.0 (0.6%)	10.0 (1.5%)	
No	648.0 (97.9%)	307.0 (46.4%)	341.0 (51.5%)	
Supernumerary Teeth				0.5
Yes	1.0 (0.2%)	1.0 (0.2%)	0.0 (0.0%)	
No	661.0 (99.8%)	310.0 (46.8%)	351.0 (53.0%)	
Paramolar				0.2
Yes	6.0 (0.9%)	1.0 (0.2%)	5.0 (0.8%)	
No	656.0 (99.1%)	310.0 (46.8%)	346.0 (52.3%)	
Distomolar				0.6
Yes	3.0 (0.5%)	2.0 (0.3%)	1.0 (0.2%)	
No	659.0 (99.5%)	309.0 (46.7%)	350.0 (52.9%)	
Macrodontia				>0.9
Yes	3.0 (0.5%)	0.0 (0.0%)	3.0 (0.5%)	
No	659.0 (99.5%)	311.0 (47.0%)	348.0 (52.6%)	
Microdontia				
Yes	10.0 (1.5%)	4.0 (0.6%)	6.0 (0.9%)	
No	652.0 (98.5%)	307.0 (46.4%)	345.0 (52.1%)	
Dilaceration				0.6
Yes	35.0 (5.3%)	18.0 (2.7%)	17.0 (2.6%)	
No	627.0 (94.7%)	293.0 (44.3%)	334.0 (50.5%)	
Fusion				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	-
Taurodontism				0.052
Yes	10.0 (1.5%)	8.0 (1.2%)	2.0 (0.3%)	
No	652.0 (98.5%)	303.0 (45.8%)	349.0 (52.7%)	
Peg-Shaped Teeth				0.8
Yes	10.0 (1.5%)	4.0 (0.6%)	6.0 (0.9%)	
No	652.0 (98.5%)	307.0 (46.4%)	345.0 (52.1%)	
Bifid Roots				>0.9
Yes	1.0 (0.2%)	0.0 (0.0%)	1.0 (0.2%)	
No	661.0 (99.8%)	311.0 (47.0%)	350.0 (52.9%)	
Talon Cusp				0.2
Yes	19.0 (2.9%)	12.0 (1.8%)	7.0 (1.1%)	
No	643.0 (97.1%)	299.0 (45.2%)	344.0 (52.0%)	
Dens Invaginatus				>0.9
Yes	1.0 (0.2%)	0.0 (0.0%)	1.0 (0.2%)	
No	661.0 (99.8%)	311.0 (47.0%)	350.0 (52.9%)	
Dentinogenesis Imperfecta				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	
Amelogenesis Imperfecta				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	
Dentin Dysplasia				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	
Hypercementosis				0.7
Yes	6.0 (0.9%)	2.0 (0.3%)	4.0 (0.6%)	
No	656.0 (99.1%)	309.0 (46.7%)	347.0 (52.4%)	
Odontodysplasia				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	
Odontome				>0.9
Yes	5.0 (0.8%)	2.0 (0.3%)	3.0 (0.5%)	
No	657.0 (99.2%)	309.0 (46.7%)	348.0 (52.6%)	
Impaction				0.082
Yes	266.0 (40.2%)	114.0 (17.2%)	152.0 (23.0%)	
No	396.0 (59.8%)	197.0 (29.8%)	199.0 (30.1%)	
Ectopic Eruption				>0.9
Yes	2.0 (0.3%)	1.0 (0.2%)	1.0 (0.2%)	
No	660.0 (99.7%)	310.0 (46.8%)	350.0 (52.9%)	
Inversion				
No	662.0 (100.0%)	311.0 (47.0%)	351.0 (53.0%)	
Transposition				>0.9
Yes	1.0 (0.2%)	0.0 (0.0%)	1.0 (0.2%)	
No	661.0 (99.8%)	311.0 (47.0%)	350.0 (52.9%)	

[1]n (%)
[2]Fisher's exact test

incisors were each found in 1.5% of patients. The highest occurrence of microdontia is found in the lateral incisors at 1.3%, followed by 0.3% in central incisors and 0.3% in canines. For macrodontia, the central incisors show a 0.6% occurrence, with premolars and molars following at 0.3% each. [Figure 2]

Other anomalies, including paramolars (0.9%), hypercementosis (0.9%), and odontomes (0.8%), were less frequently detected. Rare anomalies such as Supernumerary teeth, bifid roots, dens invaginatus, ectopic eruption, and transposition were observed in only 0.2–0.3% of patients. Notably, fusion, inversion, dentinogenesis imperfecta, amelogenesis imperfecta, dentin dysplasia, and odontodysplasia were not detected in any patient in this cohort. [Table 2]

An analysis of the association between dental anomalies and patient gender revealed that most anomalies showed no statistically significant difference between males and females ($p > 0.05$ in all cases). For instance, hypodontia was slightly more prevalent in males (1.5%) than in females (0.6%), but this difference was not statistically significant ($p = 0.20$). Similarly, dilaceration occurred in 5.3% of the overall population, with a nearly equal distribution between females (2.7%) and males (2.6%) ($p = 0.60$).

Taurodontism showed a near-significant gender difference, being more prevalent among females (1.2%) compared to males (0.3%), with a p-value of 0.052, indicating a trend toward significance but falling just short of the conventional threshold. Other anomalies such as peg-shaped teeth, microdontia, and talon cusp were observed slightly more in females, although these differences were not statistically significant (e.g., talon cusp in 1.8% of females vs. 1.1% of males; $p = 0.20$).

Macrodontia was observed exclusively in males (0.5%), while Supernumerary teeth were seen only in females (0.2%). Rare anomalies such as bifid roots, dens invaginatus, odontome, ectopic eruption, and transposition were infrequent and showed no meaningful gender-based patterns.

Although impaction was more frequently identified in males (23.0%) than females (17.2%), this difference did not reach statistical significance ($p = 0.082$). Other anomalies, including paramolar, distomolar, and hypercementosis, showed minor differences between sexes, but all comparisons

Table 4: Association between anomalies and arch in the study Population

Number Anomalies	Overall N = 321[1]	Upper Arch N = 37[1]	Lower Arch N = 229[1]	Both Arches N = 55[1]	p-value[2]
Hypodontia					**0.006**
No	307.0 (95.6%)	34.0 (10.6%)	224.0 (69.8%)	49.0 (15.3%)	
Yes	14.0 (4.4%)	3.0 (0.9%)	5.0 (1.6%)	6.0 (1.9%)	
Supernumerary Teeth					0.3
No	320.0 (99.7%)	37.0 (11.5%)	229.0 (71.3%)	54.0 (16.8%)	
Yes	1.0 (0.3%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (0.3%)	
Paramolar					0.6
No	316.0 (98.4%)	36.0 (11.2%)	225.0 (70.1%)	55.0 (17.1%)	
Yes	5.0 (1.6%)	1.0 (0.3%)	4.0 (1.2%)	0.0 (0.0%)	
Distomolar					>0.9
No	319.0 (99.4%)	37.0 (11.5%)	227.0 (70.7%)	55.0 (17.1%)	
Yes	2.0 (0.6%)	0.0 (0.0%)	2.0 (0.6%)	0.0 (0.0%)	
Macrodontia					0.051
No	318.0 (99.1%)	35.0 (10.9%)	228.0 (71.0%)	55.0 (17.1%)	
Yes	3.0 (0.9%)	2.0 (0.6%)	1.0 (0.3%)	0.0 (0.0%)	
Microdontia					**<0.001**
No	311.0 (96.9%)	31.0 (9.7%)	229.0 (71.3%)	51.0 (15.9%)	
Yes	10.0 (3.1%)	6.0 (1.9%)	0.0 (0.0%)	4.0 (1.2%)	
Dilaceration					**0.023**
No	286.0 (89.1%)	37.0 (11.5%)	203.0 (63.2%)	46.0 (14.3%)	
Yes	35.0 (10.9%)	0.0 (0.0%)	26.0 (8.1%)	9.0 (2.8%)	
Fusion					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Taurodontism					0.14
No	311.0 (96.9%)	37.0 (11.5%)	223.0 (69.5%)	51.0 (15.9%)	
Yes	10.0 (3.1%)	0.0 (0.0%)	6.0 (1.9%)	4.0 (1.2%)	
Peg-Shaped					**<0.001**
No	311.0 (96.9%)	29.0 (9.0%)	229.0 (71.3%)	53.0 (16.5%)	
Yes	10.0 (3.1%)	8.0 (2.5%)	0.0 (0.0%)	2.0 (0.6%)	
Bifid Roots					>0.9
No	320.0 (99.7%)	37.0 (11.5%)	228.0 (71.0%)	55.0 (17.1%)	
Yes	1.0 (0.3%)	0.0 (0.0%)	1.0 (0.3%)	0.0 (0.0%)	
Talon Cusp					**<0.001**
No	302.0 (94.1%)	33.0 (10.3%)	228.0 (71.0%)	41.0 (12.8%)	
Yes	19.0 (5.9%)	4.0 (1.2%)	1.0 (0.3%)	14.0 (4.4%)	
Dens Invaginatus					0.3
No	320.0 (99.7%)	37.0 (11.5%)	229.0 (71.3%)	54.0 (16.8%)	
Yes	1.0 (0.3%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (0.3%)	
Dentinogenesis Imperfecta					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Amelogenesis Imperfecta					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Dentin Dysplasia					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Hypercementosis					0.10
No	315.0 (98.1%)	37.0 (11.5%)	226.0 (70.4%)	52.0 (16.2%)	
Yes	6.0 (1.9%)	0.0 (0.0%)	3.0 (0.9%)	3.0 (0.9%)	
Odontodysplasia					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Odontome					0.057
No	316.0 (98.4%)	37.0 (11.5%)	227.0 (70.7%)	52.0 (16.2%)	
Yes	5.0 (1.6%)	0.0 (0.0%)	2.0 (0.6%)	3.0 (0.9%)	
Impaction					**<0.001***
No	55.0 (17.1%)	19.0 (5.9%)	29.0 (9.0%)	7.0 (2.2%)	
Yes	266.0 (82.9%)	18.0 (5.6%)	200.0 (62.3%)	48.0 (15.0%)	
Ectopic Eruption					**0.013***
No	319.0 (99.4%)	35.0 (10.9%)	229.0 (71.3%)	55.0 (17.1%)	
Yes	2.0 (0.6%)	2.0 (0.6%)	0.0 (0.0%)	0.0 (0.0%)	
Inversion					
No	321.0 (100.0%)	37.0 (11.5%)	229.0 (71.3%)	55.0 (17.1%)	
Transposition					0.3
No	320.0 (99.7%)	37.0 (11.5%)	229.0 (71.3%)	54.0 (16.8%)	
Yes	1.0 (0.3%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (0.3%)	

[1]n (%)
[2]Pearson's Chi-squared test; Fisher's exact test *=statistically significant p values

yielded p-values well above the 0.05 threshold. [Table 3]

The analysis of anomaly distribution by arch revealed several statistically significant associations between specific dental anomalies and their location within the upper, lower, or both arches. Among the 321 patients with identified anomalies, the lower arch was most commonly affected, seen in 71.3% of cases, followed by anomalies in both arches (17.1%), and the upper arch alone (11.5%).

A significant association was found for hypodontia ($p = 0.006$), which occurred more frequently in patients with anomalies affecting both arches (1.9%) and the lower arch (1.6%), compared to the upper arch alone (0.9%). Microdontia ($p < 0.001$) and peg-shaped teeth ($p < 0.001$) were predominantly located in the upper arch, particularly the maxillary anterior region, with 1.9% and 2.5% of upper-arch anomalies, respectively. These findings align with established patterns, as peg-shaped maxillary lateral incisors are a common site of localized microdontia.

Dilaceration also showed a statistically significant arch-based association ($p = 0.023$), with the majority of cases found in the lower arch (8.1%) and both arches (2.8%), but none observed exclusively in the upper arch. Similarly, talon cusp demonstrated a strong arch-based distribution ($p < 0.001$), being more frequently observed in both arches (4.4%) and to a lesser extent in the upper arch (1.2%).

Impaction, the most common anomaly overall, had a significant arch distribution pattern ($p < 0.001$). A large proportion of impactions were located in the lower arch (62.3%), followed by cases involving both arches (15.0%) and the upper arch only (5.6%). This distribution reflects the common occurrence of impacted mandibular third molars.

Other anomalies, such as ectopic eruption ($p = 0.013$) and macrodontia ($p = 0.051$), also showed near-significant or significant trends. Ectopic eruption was observed only in the upper arch (0.6%), while macrodontia was slightly more common in the upper arch (0.6%) and lower arch (0.3%).

For most other anomalies—including paramolar, distomolar, taurodontism, hypercementosis, odontome, and transposition—no statistically significant arch-based differences were detected ($p > 0.05$). Notably, several rare anomalies (fusion, inversion, amelogenesis imperfecta, dentinogenesis imperfecta, dentin dysplasia, odontodysplasia) were absent across all arch categories.

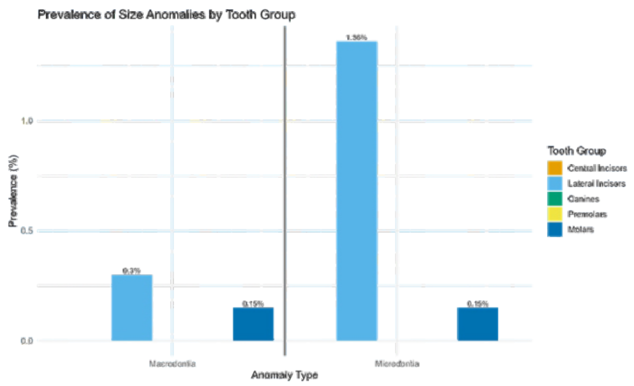

Figure 2: Prevalence of Dental Anomalies of size

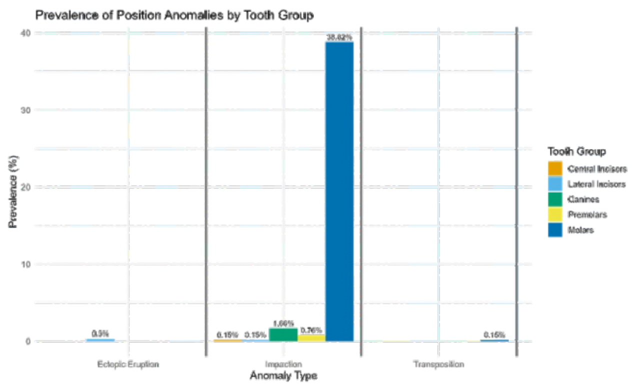

Figure 3: Prevalence of Dental Anomalies of position

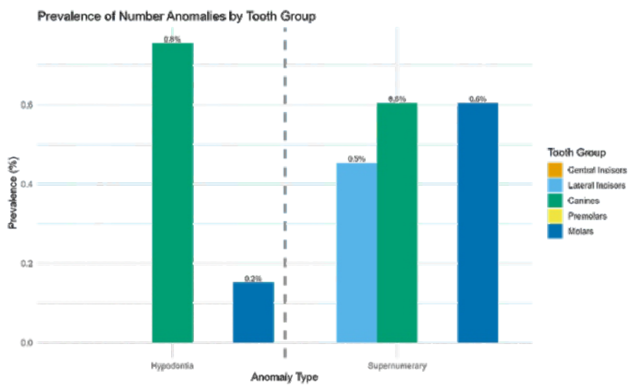

Figure 4: Prevalence of Dental Anomalies of Number

Discussion

The prevalence and pattern of dental anomalies observed in our Lagos clinic show some similarities to reports from other Nigerian and African populations, as well as notable differences. In our study, 49.4% of patients had at least one dental anomaly, with the mandible being the most commonly affected (34.6%). This high frequency is partly attributable to the inclusion of impacted third molars, a crucial methodological factor. By contrast, previous Nigerian studies have generally reported lower overall anomaly rates.[1,3,14–16] For example, a pediatric-focused study in Lagos found a dental anomaly prevalence of about 17.5%, with enamel hypoplasia being the most common issue and anomalies more frequently affecting the maxilla.[1] Likewise, an orthodontic clinic study in Ghana reported anomalies in 51.1% of patients, but this was primarily driven by the high occurrence of midline diastema (48.3%). In that Ghanaian sample, impacted teeth were the second most common anomaly (22.0%), followed by dilaceration (11.9%) and peg-shaped lateral incisors (6.8%).[5] Our impaction rate (40.2%) is higher than these West African reports, likely because our sample included was older in comparison with a median age of 33.08 years, whereas the Ghanian study had a mean age of 14.6 years. Interestingly there was no significant gender association with the presence of anomalies in our sample, which corresponded with findings in similar African studies in Ghana and Sudan.[9,10]

Impacted teeth were the most prevalent anomaly in our study, accounting for about 40% of all anomalies identified. This aligns with the well-known fact that impaction is a common finding in dental practice, especially when third molars are considered. Globally, the prevalence of tooth impaction ranges from as low as 18% to as high as 70% in different populations.[17–19] Third molars are by far the most frequently impacted teeth (comprising ~95% of all impactions), followed by maxillary canines, then incisors and premolars.[11,18,19] Our inclusion of third molars likely and the higher median age of our sample (33.08) explains the upper-end impaction frequency observed. A Croatian study of 12–16-year-old orthodontic patients found only 6.3% with impactions, and an Italian radiographic survey of 8–18-year-olds reported impactions in 12.0% of subjects (primarily upper canines, 9.2%).[12] Our 40.2% dwarfs these figures because our sample's broader age range means many fully formed third molars that failed to erupt. A study in Sudan (orthodontic patients aged 11–30) reported an impaction prevalence of 11.1%, mostly in the maxilla, which is closer to the Italian and Croatian figures and again much lower than ours due to differences in sample age and third molar inclusion.[10]

Arch-related patterns were also observed, impacted teeth showed a statistically significant association with jaw: mandibular impactions were more common than maxillary impactions (especially for third molars), whereas maxillary canine impaction was a notable subset in the upper arch. This mirrors findings in other populations like Yemeni, China, Singapore, Saudi and Ghana.[2,11,17,18,20,21]

Hypodontia, the congenital absence of one or more teeth (excluding third molars), was the fourth most common anomaly in our study (2.1% of patients). This rate is on the lower end of global reports. In general populations worldwide (permanent dentition), hypodontia prevalence is usually around 4–8% when third molars are not counted. For example, studies in Europe have found hypodontia around 7.1–7.4% (Italy and Sweden).[2] In the Middle East, a Yemeni study reported 7.48% hypodontia, and our neighbouring Sudan reported 8.0% hypodontia among orthodontic patients.[9–11] By contrast, some African and Asian studies have observed lower frequencies as low as 2–4% in certain populations. A study in Egypt found a prevalence of 2.6% for hypodontia, and a large Indian study reported a prevalence of 4.19%, both higher than our 2.1%, but still comparatively modest.[22,23] The patterns of teeth most often missing in our cohort align with those in other studies. We found the maxillary lateral incisor to be the most frequently absent tooth (followed by mandibular second premolars), a trend widely reported in the literature.[24–26] Maxillary lateral incisors are often top of the list in Caucasian and African populations, and notably, females tend to have hypodontia (especially lateral incisor agenesis) more often than males. By contrast, hyperdontia (supernumerary teeth) is typically more common in males. In our study, supernumerary teeth were very rare (only a couple of mesiodens cases, <1%).[14,29,30] This is consistent with prior findings in Nigeria and globally, hyperdontia usually affects ~0.1–3% of people. A Yemeni study found supernumeraries in 0.99% of patients, matching reports from Turkey (around 0.98%). Interestingly, much higher rates of supernumerary teeth have been reported in certain populations, up to 8% in parts of India and 15% in one French study.[22,27] In general, our finding of ~1% supernumerary prevalence fits well within the expected range.

Talon cusp was another noteworthy shape anomaly in our study, present in about 2.9% of patients. The prevalence of talon cusps globally is quite variable but generally low. A systematic review reported the prevalence of talon cusp in permanent dentition ranging from <1% up to about 8% in different ethnic groups.[22,28] Our observed rate of ~3% falls within this broad range and might be slightly above the average reported in many studies (which tend to hover around 1% or less).[12,13]

The findings of this study carry several important implications for general dental practice, orthodontics, and public health awareness in Nigeria. First and foremost is the value of early diagnosis. Many of the anomalies we identified, impacted canines or premolars, congenitally missing teeth, and even supernumerary teeth, can and should be detected in childhood or adolescence. Early radiographic screening (using panoramic radiographs in the mid-teen years) can reveal if a canine is impacted or a second premolar is missing, at a time when interceptive action is most effective. The high frequency of anomalies like impactions in our adult sample emphasizes the need for early detection and diagnosis to prevent complications. Our study's results echo the conclusions of other researchers in stressing that proactive identification of dental anomalies is crucial. Amuasi et al. in Ghana wrote that thorough dental examinations and early correction of anomalies are "crucial to prevent future complications".[5]

Conclusion

This study provides an overview of dental anomalies in a Nigerian orthodontic population and compares these findings with regional and global data. The patterns we observed broadly mirror global trends, with understandable variations due to methodology and population differences. Early diagnosis and integrated treatment planning for dental anomalies can prevent complex dental problems, and this research reinforces that message. Going forward, we hope our findings stimulate further research in diverse Nigerian populations and encourage practitioners to routinely assess for developmental anomalies as part of comprehensive dental care.

Competing interest

The authors declare no competing interests.

Authors' Contributions:

OU designed the study; SE collected and analyzed data; both drafted and revised the manuscript.

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