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A radiographic assessment of the prevalence and pattern of dental agenesis in a Nigerian population

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ABSTRACT:

Objective: Dental agenesis is responsible for dental presentation for orthodontic, restorative and prosthodontic reasons. This study presents the prevalence and pattern of permanent tooth agenesis in a group of Nigerian patients.

Methods: Orthopantomograms of orthodontic patients were assessed for missing permanent teeth. Demographic data was obtained, and the prevalence and pattern of individual tooth agenesis presented. The relationship between dental agenesis and gender, jaw as well as side affected was assessed using the Chi square test while the Student's T-test was used to assess the variation in number of missing teeth across the genders. Data was analysed using the SPSS version 22. Statistical significance was set at $p<0.05$.

Results: Tooth agenesis including third molars was observed in 37(17.1%) while exclusion of the third molars gave an agenesis prevalence of 10.2% in 22 patients. There was no significant difference in the prevalence of dental agenesis based on gender whether third molars were considered or not (p=0.77 and p=0.37). There was no significant difference in mean number of missing tooth per person based on gender whether third molars were considered (p=0.12) or excluded from analysis (p=0.26). There was significant difference in the type of tooth involved in agenesis and the arch affected (p=0.01).

Conclusion: The prevalence of dental agenesis among this group of patients is comparable with that from other populations. Excluding third molars, incisors are more predisposed to agenesis in the maxilla, while premolars are more likely not to develop in the mandible.

KEYWORDS: Agenesis, prevalence, pattern, Nigeria

INTRODUCTION: The teeth and occlusion serve the three important functions of maintaining aesthetics, enhancing functional mastication and effective speech pronunciation.[1,2] Congenitally missing teeth which can present as anodontia, hypodontia or oligodontia therefore present peculiar disabilities to the individual who suffers any of these conditions. The disability may range from the unaesthetic missing single anterior tooth[3]to the dysfunctional mastication associated with missing multiple posterior teeth.[4,5] In many cases, missing teeth are significant enough reasons for extensive oral rehabilitation requiring orthodontic, restorative and prosthodontic procedures at the dental clinic,[1] as various combinations of poor aesthetics and occlusal

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dysfunction are presented by the patients.

The prevalence of congenitally missing teeth when third molars are excluded has been reported to vary from as low as 0.03% to 12.6% depending on the nature of the study population assessed by the researchers.[2,6,7]The factors responsiblefor this variation in reportedprevalence include the demographic, ethno-geographic and evolutionary characteristics of the studied population[2]The consensus is that there is no gender prevalence in dental agenesis that excludes third molars.6 Third molars are the single most commonly involved teeth in dental agenesis with a prevalence of 20%-31.9%[8-11] Many studies report a preponderant female tendency for congenitally missing third molars than males.[9,10,11] The genetic defect responsible for dental agenesis particularly of third molars and second premolars has been explored by researchers.[12-15]Dental agenesis has been reported to occur as isolated incidences, because of congenital anomalies such as clefts or in combination with other anomalies as syndromes[7] There is a dearth of African studies that report the prevalence and pattern of dental agenesis based on radiological assessments as

observed by review and meta-analytic studies.[16-18] This study aimed to bridge this information gap and present the prevalence and pattern of dental agenesis in a cross section of Nigerian orthodontic patients.

METHODS

This was an observational cross-sectional study. Ethical approval was obtained from the University of Ibadan/University College Hospital Institutional Review Board(Approval number UI/EC/16/0177). Orthopanthomograms (OPGs) of patients aged 10years and above, taken from January 2008 to March 2017 and domiciled in the orthodontic unit of the department of Child Oral Health in the parent institution were retrieved for assessment. Hard and soft copies of the OPGs were obtained by authors JUI and OOT. Ten (10) radiographs were excluded (all hard copies) due to poor picture quality (hazy and/or faded). The hard copy images were viewed using a portable viewing box in a darkened room, while soft copies were viewed on a laptop screen using the PDF Nitro software. The radiographs were assessed in batches by the three authors and a tooth was ascribed as being absent only when all authors agreed on its absence. Patients whose complete records could not be assessed or who had previous dental extractions of permanent teeth were excluded from the study. The age cut-off was based on a report that the radiographic visualization of the third molar follicle, which is the last tooth to form could be delayed up to the age of ten years.[19] The demographic data was obtained from the clinic's patient daily record book and case notes. The presence or absence of each permanent tooth as observed on the OPG was recorded. The visibility of the tooth follicle even without obvious evidence of calcification particularly for the third molars was taken to indicate presence of the tooth. The prevalence and pattern of individual tooth agenesis are presented. The relationship between prevalence of dental agenesis and gender was assessed using the Chi square testwhile the Student's T-test was used to assess the variation in number of missing teeth across the genders. Data was analyzed using the SPSS version 22. All findings are presented in tables. Statistical significance was set at p<0.05.

RESULTS

A total of 216 patients OPGs and records were retrieved. The age ranged between 10-46 years, but the age distribution was skewed towards the paediatric age group (Kolmogorov-Smirnov p<0.001). Median age was 14years (IQR 12-22years). One hundred and eighteen patients (54.6%) were females, the rest (45.4%) were males. Tooth agenesis including third molars was observed in 37(17.1%) of the patients accounting for a total number of 95 missing teeth. No case of anodontia was observed in this study. Hypodontia was present in 34(91.9%) patients and oligodontia in 3 (8.1%). Third molars accounted for 41(43.2%) of these missing teeth. Exclusion of the third molars gave an agenesis prevalence of 10.2% observed in 22 patients and accounting for 54(56.8%) missing teeth. Since a relatively large number of the missing teeth were third molars, analysis of other missing teeth was separated from that of missing third molars to avoid bias. Agenesis on basis of tooth type is as shown in table 1. The mean number of missing teeth per person was 2.5±1.9 when third molars were not considered but increased to 2.6±2.0 teeth per person when third molars were considered. There was no significant difference in the prevalence of dental agenesis between males and females whether third molars were considered or not (p=0.77 and p=0.37 respectively). There was no significant difference in mean number of missing tooth per person based on gender whether third molars were considered (p=0.12) or excluded from analysis (p=0.26). This is as presented in table 2. There was significant difference in the type of tooth involved in agenesis and the arch affected when third molars were excluded as shown in table 3 (p=0.01). More third molarswere missing in the maxillary arch than in the mandibular and this was a significant finding as seen in table 4(p=0.04). More individuals had bilateral affectation by dental agenesis than unilateral affectation whether of third molars or of other teeth in the series. However, this was not a statistically significant finding. In addition, the maxillary arch was more affected by agenesis than the mandibular in isolation or both arches together in individuals. Again, this relationship was not statistically significant. This is presented in table 5.

Table 1: Dental agenesis according to type of tooth

Tooth type	Arch		Total
	Maxillary	Mandibular	
Central incisor	2(100.00)	0(0.0)	2(100.0)
Lateral incisor	12(63.2)	7(37.8)	19(100.0)
Canine	2(100.0)	0(0.0)	2(100.0)
First premolar	0(0.0)	2(100.00	2(100.0)
Second molar	8(33.3)	16(66.7)	24(100.0)
First molar	1(100.0)	0(0.0)	1(100.0)
Second molar	3(75.0)	1(25.0)	4(100.0)
Third molar	27(65.9)	14(34.1)	41(100.0)
Total	55(57.9)	40(42.1)	95(100.0)

Table 2: Relationship between gender and number of missing teeth per person

Variable						
Number of missing teeth including third molars	Gender	Mean	F test	P value	95% confidence interval	
	Male	2.19±1.56	2.49	0.12	-2.14	0.80
	Female	2.86±2.56				
Number of missing teeth excluding third molars						
	Male	2.13+1.25	1.32	0.26	-2.30	1.26
	Female	2.64+2.21				

Table 3: Relationship between tooth type and arch affected by agenesis (excluding third molars)

Tooth type	Arch		Total
	Maxillary	Mandibular	
Anterior	16(59.1)	7(40.9)	23(100.0)
Premolars	8(33.3)	18(66.7)	26(100.0)
Molars	4(83.3)	1(16.7)	5(100.0)
Total	28(50.0)	26(50.0)	54(100.0)

p=0.01:X^2=9.10

Table 4: Relationship between third molar agenesis and the arch affected

Agenesis	Arch		Total
	Maxillary	Mandibular	
Present	405(93.8)	418(96.8)	823(95.2)
Absent	27(6.2)	14(3.1)	41(4.7)
Total	432(100.0)	432(100.0)	864(100.0)

p=0.04:X^2=4.33

Table 5: Pattern of dental agenesis with respect to jaw and side affected

Variables	Agenesis		Total	P value
	Observed	Not observed		
Side involved in third molar agenesis				
Left	6(31.6)	2(11.1)	8(21.6)	
Right	4(21.1)	5(27.8)	9(24.3)	0.32
Bilateral	9(47.4)	11(61.1)	20(54.1)	$X^2 = 2.27$
Total	19(100.0)	18(100.0)	37(100.0)	
Side involved in agenesis of other teeth				
Left	4(18.2)	4(26.7)	8(21.6)	
Right	4(18.2)	5(33.3)	9(24.3)	0.36
Bilateral	14(63.6)	6(40.0)	20(54.1)	$X^2 = 2.06$
Total	22(100.0)	15(100.0)	37(100.0)	
Arch involved in third molar agenesis				
Maxillary	8(42.1)	9(50.0)	17(45.9)	
Mandibular	4(21.1)	6(33.3)	10(27.0)	0.36
Both	7(36.8)	3(16.7)	10(27.0)	$X^2 = 2.03$
Total	19(100.0)	18(100.0)	37(100.0)	
Arch involved in third molar agenesis				
Maxillary	8(42.1)	9(63.0)	17(45.9)	
Mandibular	4(21.1)	2(25.0)	10(27.0)	0.24
Both	7(36.8)	4(53.8)	10(27.0)	$X^2 = 2.84$
Total	22(48.1)	15(51.9)	37(100.0)	

DISCUSSION

The present study has observed a prevalence of agenesis that is within the expected limits when compared withother populations.[1,6,7,12]In congruence with previous findings, the third molar was most affected in our study population.[8,11,20]This is aresult of genetics and functional jaw size,[20] as well as the fact the third molars are the very last to develop in the entire dental series. Bolk's theory of terminal reduction proposed that the most distal tooth in each dental series was most likely to be involved in an anomaly.[21] Hence, third molars, second premolars and lateral incisors and most likely to be affected by anomalies.[21]The second most affected tooth in this study was the lower second premolar, in agreement with reports from Eastern Bavaria, Portugal and Bucharest[1,6,22] but contrary to findings in the Malay and Pakistani populations[7,10] where the lateral incisor was reported to be most affected. It has been reported that opinions on the second most affected tooth by agenesis swings between these teeth, that is, the upper lateral and lower second premolar.[12]

There was no gender difference in the prevalence of tooth agenesis of other teeth in this study as already affirmed by previous studies.[6] Our study also did not confirm the general female propensity for missing third molars.[9-11]

There was no significant difference in arch involvement of dental agenesis hen third molars were not considered among our patients and this is contrary to the previously reported maxillary preponderance.[7,10]However,third molar agenesis conformed to the generally reported maxillary prevalence. The presented study also observed that apart from third molars, incisors were more likely absent in the maxilla, while premolars are more likely absent in the mandible. A previous report observed a higher right sided prevalence for dental agenesis,[23] but our study did not confirm this as most of the assessed population had bilateral dental agenesis. However, since the afore-mentioned was not a significant finding, the clinical value of the finding is irrelevant so long as the patient's management ends in a balanced, functional and aesthetic occlusion.

CONCLUSION

This study confirms that third molar agenesis is the most prevalent type of dental agenesis. Incisor

agenesis is most likely in the maxilla while premolar agenesis prevails in the mandible.

REFERENCES

1. Behr M, Proff P, Leitzmann M, et al. Survey of congenitally missing teeth in orthodontic patients in Eastern Bavaria. Eur J Orthod. 2011;33(July 2010):32–36.

2. Amini F, Rakhshan V, Babaei P. Prevalence and pattern of hypodontia in the permanent dentition of 3374 Iranian orthodontic patients. Dent Res J. 2012;9(3):245–250.

3. Sanu OO and OT Temisanren. A review of 39 cases of unerupted maxillary incisors. Nig J Clin Pract. 2002;6(1):60–64.

4. Mahoorkar S, Puranik SN, Moldi A, Chowdhary R, Majge B. Management of Supra-erupted Posterior Teeth- A Review. Int J Dent Clin. 2010;2(3):27–30.

5. Dosumu OO, Ogunrinde JT, Bamigboye SA. Knowledge of consequences of missing teeth in patients attending Prosthetic clinic in UCH Ibadan. Ann Ibd Pg Med. 2014;12(1):42–48.

6. Coelho ASEC, Macho VMP, Andrade DJC, Augusto APC, Areias CMF. Prevalence and distribution of tooth agenesis in a pediatric population: a radiographic study. Rev Gauch Odontol. 2012;60(4):503–508.

7. Majeed MM, Ahmed I, Uzair M, Atif M. Prevalence of missing, impacted and supernumerary teeth in patients under orthodontic treatment in a teaching hospital of Karrachi, Pakistan. Int J Dent Heal Sci. 2014;01(01):39–46.

8. Celikoglu M, Kamak H. Patterns of third-molar agenesis in an orthodontic patient population with different skeletal malocclusions. Angle Orthod. 2012;82(1):165–169. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21815812

9. Bhutta N and Sadozai SRK. Association of missing third molars with various skeletal patterns. Pakistan Oral Dent J. 2013;33(2):307–311.

10. Mani SA, Salmah W, Mohsin Y, John J. Prevalence and patterns of tooth agenesis among Malay children. Southeast Asian J Trop Med Public Heal. 2014;45(2):490–498.

11. Suja AG, Jose J, Prasanth SP and Manoj W. Prevalence of third molar agenesis in population with skeletal class II pattern. Int J Bioassays. 2015;4(7):4165–4170.

12. Vastardis H. The genetics of human tooth agenesis : New discoveries for understanding dental anomalies. Am J Orthod Dentofac Orthop. 2000;117:650–656.

13. Das P, Patel PI. Hypodontia : genetics and future perspectives. Braz J Oral Sci. 2005;4(13):695–706.

14. Nieminen P. Molecular Genetics of Tooth Agenesis. University of Helsinki; 2007.

15. Pani SC. The genetic basis of tooth agenesis: basic concepts and genes involved. J Indian Soc Pedod Prev Dent. 2011;29(2):84–89. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21911943

16. Polder BJ, Van't Hof MA, Van Der Linden FPGM, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. Community Dent Oral Epidemiol. 2004;32(3):217–226.

17. Rakhshan V. Congenitally missing teeth (hypodontia): A review of the literature concerning the etiology, prevalence, risk factors, patterns and treatment. Dent Res J (Isfahan). 2015;12(1):1-13. Available from: http://www.drjjournal.net/text.asp?2015/12/1/1/150286

18. Rakhshan V, Rakhshan H. Meta-analysis and systematic review of the number of non-syndromic congenitally missing permanent teeth per affected individual and its influencing factors. Eur J Orthod. 2016;38(2):170–177.

19. Logan WHG, Kronfeld R. Development of the human jaws and surrounding structures from birth to the age of fifteen years. J Am Dent Assoc. 1933;20(3):1933.

20. Kömerik N, Topal O, Esenlik E, Bolat E. Skeletal facial morphology and third molar agenesis. J Res Pr Dent Pr Dent. 2014 (Apr 17);2014:1–11. Available from: http://www.ibimapublishing.com/journals/DENT/2014/452422/452422.html

21. Durrani OK, Zulfiqar K, Bashir U, Shamsher M. Prevalence of tooth agenesis in orthodontic patients at Islamic

International Dental Hospital. Pakistan Orthod J. 2010;2(2):48–51. Available from: http://www.poj.org.pk/index.php/poj/article/view/3

22. Bozga A, Stanciu RP, Mǎnuc D. A study of prevalence and distribution of tooth agenesis. J Med Life. 2014;7(4):551–554. Available from: http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=99779472&site=eds-live

23. Abu-hussein M, Watted N, Watted A, Abu-hussein Y, Yehia M. Prevalence of Tooth Agenesis in Orthodontic Patients at Arab Population in Israel. Int J Public Heal. 2015;3(3):77–82.