ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 12 | December - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

DENTAL ANOMALIES IN PATIENTS WITH CLEFT LIP AND/OR PALATE

Medical Science

Bibek Kumar Mandal Associate Professor, North Bengal Dental College and Hospital, Darjeeling, West Bengal, 734102.

Ali Asger Nakib* Associate Professor, Bankura Sammilani Medical College and Hospital, Bankura, West Bengal-722102. *Corresponding Author

ABSTRACT

Background: Individuals with cleft lip and palate (CLP) show a high frequency of dental anomalies. These anomalies may complicate orthodontic treatment and oral rehabilitation. The aim of the present study was to evaluate the prevalence of dental anomalies in individuals with non - syndromic cleft lip and/ or palate according to gender and type of cleft. **Methods:** one hundred and twelve children (59 males and 53 females aged five to 12 years (mean age 7.96 years) were included in this study. We analyzed dental anomalies in the premaxillary region according to the gender and the cleft type by examining medical records, intra-oral photographs, dental casts and panoramic radiographs. Fisher's exact test and Chi- square test were applied to determine whether any statistical differences exist or not between cleft types and gender. The level of significance was set at $p \leq 0.05$. **Results:** Overall 86.6% of subjects were found to have at least one dental anomaly. The frequency was slightly more ($p=0.07$) in females (90.56%) compared to males (77.96%) Agenesis (n=49, 43.8%) and ectopic eruption (22.3%) of teeth were the two most common dental anomalies. The most commonly affected tooth was the primary maxillary lateral incisor in this study. The frequency of anomalies did not differ significantly between unilateral and bilateral cleft types.

KEYWORDS

Cleft lip and palate, Dental anomalies, tooth agenesis, supernumerary tooth, microdontia, enamel hypoplasia

INTRODUCTION

Cleft lip and/or palate (CLP) is the most common birth-deformity of the orofacial region.[1-6] Worldwide, their incidence is 1 in 700 newborns. The etiology of CLP is multifactorial with both genetic and environmental factors playing an important role. Similar to the general population, individuals with orofacial cleft show developmental dental disturbances. There appears to be a close genetic and anatomic relationship between the development of lip, palate and tooth buds.[7,8] Moreover, some investigators suggest that these anomalies may represent an additional clinical marker for CLP.[6,8,9]

Dental anomalies may occur in and outside the cleft area and both primary and permanent dentition may be affected. The lateral incisor in the alveolar cleft region has the highest prevalence of congenital dental deformities. In the current literature, tooth anomalies of number are reported as the most frequent dental anomalies among the cleft patients.[9-13] These anomalies include agenesis of tooth and supernumerary teeth. According to Lopes et al[14] (1991), the tooth abnormalities of number are seven times more frequent in individuals with cleft lip and/or palate compared to the overall population. Furthermore, with increasing severity of the cleft, the number of missing teeth increases.[6,14-16]

The prevalence of congenital dental malformations in individuals with CLP has been found to vary depending on geographic location and ethnic background. For example, Al-Kharboush et al,[11] found dental anomalies in 91.4% Saudi individuals with CLP and hypodontia (46.5%) was the most prevalent dental anomaly, followed by microdontia (31.6%), ectopic eruption (10.4%) and supernumerary tooth (9%). Similarly, Sá et al,[17] observed dental deformities in 88.2% of cleft patients in Brazil. They reported tooth agenesis (47.1%), rotation (20%) and microdontia (15.5%) as the most common anomalies. Nicholls found 94% of the cleft population with at least one dental anomaly. Agenesis (15%) was the most prevalent, and supernumerary teeth were found in 10% of patients. Menezes et al,[6] observed 47 individuals (32.19%) with one or more specific dental anomaly. Rullo, et al.[13] (2015) found a high prevalence of enamel defects in cleft population.

Individuals with CLP suffer from a variety of problems including malocclusion and maintenance of oral hygiene. The presence of various types of dental deformities may complicate orthodontic treatment and oral rehabilitation. Therefore knowledge of developmental anomalies is essential for successful dental treatment. The majority of previous reports have described dental developmental disturbances in European, Brazilian and Arabic cleft populations. To the best of our knowledge, no such study was carried out among the Bengali population with CLP. Therefore, the present study was designed to evaluate the prevalence of dental anomalies among the homogeneous Bengali population and their possible association with the gender and various cleft subphenotypes.

Methods

Subjects

In this retrospective cross-sectional study, pretreatment orthodontic records of individuals born with non-syndromic orofacial cleft were investigated. These records include panoramic, periapical and upper occlusal radiographs, intra-oral photographs, and dental casts. Subjects with cleft lip and /or palate aged between 5 and 12 years were randomly selected. Exclusion criteria were: patients who had previous orthodontic treatment, dental extraction, the absence of radiographs and incomplete dental records. Ethical approval for the present study was obtained from the Ethical committee of our institute.

Determination Of Cleft Type

The determination of cleft type was based on the examination of dental casts, radiographs, and description in the medical records. The orofacial clefts were classified into the following types: cleft lip only (CL), unilateral left cleft lip and palate (ULCLP), unilateral right cleft lip and palate (URCLP), bilateral cleft lip and palate (BCLP), and isolated cleft palate (CP).

Dental Evaluation

Data on tooth abnormalities of each subject were recorded on standardized forms. Dental anomalies in and outside the cleft in the premaxillary region were investigated. In order to avoid inter-examiner differences, all records were investigated by one trained examiner (SM). Radiographs were examined in a darkroom after mounting on a view box. In addition, intra-oral photographs and dental casts were also examined for determination of dental anomalies. The following anomalies were investigated:

1. Agenesis: Absence of a tooth germ both clinically as well as radiographically.
2. Rotation: Mesio or disto—lingual displacement of teeth.
3. Ectopic eruption: When a tooth does not follow its usual course.
4. Supernumerary teeth: Teeth present in addition to its normal series.
5. Microdontia: When a tooth appears smaller than normal
6. Enamel hypoplasia: When there is an obvious discontinuity of surface enamel or the surface may be intact with white, yellow or brownish discolouration.

Statistical Analysis

The analysis was performed using statistical software Epi Info version 7.2 (CDC, Atlanta, USA). The occurrence of dental anomalies was expressed as frequency and percentage of the total sample using descriptive statistics. Fisher's exact test and Chi- square test were' applied to determine whether any statistical differences exist or not between cleft types and gender. The level of significance was set at $p \leq 0.05$.

RESULTS

In this study, 112 cleft subjects were almost equally divided among males (n =59, 52.7%) and females (n=53, 47.3%). The mean age of the patients was 7.96 year. The most frequently observed cleft types were by UCLP-L (n=42, 37.5%) followed BCLP (n=37, 33%), UCLP-R (n= 14, 12.5%) and CL (n= 10, 8.9%). Only 9 subjects (8%) had CP. [Table 1] The distribution of cleft types did not vary significantly between male and female subjects (P>0.05, Chi- square).

Table1. Distribution Of Cleft Subtypes According To Genders

Gender	UCLP		BCLP	CL	CP
	Left N (%)	Right N (%)	N (%)	N (%)	N(%)
Male(N=59)	25(42.4)	9(15.3)	16(27.1)	5(8.5)	4(6.8)
Female(N=53)	17(32.1)	5(9.4)	21(39.6)	5(9.4)	5(9.4)
Total(N=112)	42(37.5)	14(12.5)	37(33)	10(8.9)	9(8)

Overall 86.6% (n=97) of subjects were found to have at least one dental anomaly. A higher incidence of the dental anomaly was observed in females (n=48, 90.56%) compared to males (n=46, 77.96%), although this difference was not statistically significant (p=0.07).

Table2. Distribution Of Dental Anomalies According To Gender

Dental anomalies	Total N (%)	Male N (%)	Female N(%)	Fisher Exact
Agenesis of tooth	49(43.8)	24(40.7)	25(47.2)	0.26
Rotation	24(21.4)	15(25.4)	9(16.9)	0.85
Ectopic eruption	25(22.3)	13(22)	12(22.6)	0.25
Supernumerary tooth	19(16)	10(16.9)	9(15.1)	0.45
Microdontia	12(10.7)	6(11.7)	6(11.3)	NS
Enamel hypoplasia	8(7.1)	3(5.1)	5(9.4)	0.85

Table 2 shows the distribution of dental anomalies according to gender. The most frequently observed anomaly was agenesis of the tooth (n=49, 43.8%) and enamel hypoplasia (n=8, 7.1%) was the least prevalent anomaly in this study.

Table3. Distribution Of Dental Anomalies According To Cleft Types

	UCLP (n=56)				BCLP (n=37)		CL (n-10)		CP (n=9)	
	Left (n= 42)		Right (n=14)							
	M	F	M	F	M	F	M	F	M	F
Agenesis of tooth	12	7	2	4	7	10	2	2	1	2
Rotation	7	3	2	1	3	4	2	0	1	1
Supernumerary tooth	4	2	1	1	3	3	2	1	0	2
Ectopic eruption	5	6	2	1	4	5	0	0	2	0
Microdontia	3	2	2	0	1	3	0	0	0	1
Enamel hypoplasia	2	0	1	0	0	4	0	1	0	0
Total	33	20	10	7	18	29	6	4	4	6

Table 3 describes the distribution of the dental anomalies according to cleft types. Overall, 198 dental anomalies were observed in 112 cleft subjects. Agenesis of the tooth was the most commonly occurring dental anomaly in all cleft types. The frequency of anomalies did not differ significantly between UCLP and BCLP; [Table 4] Overall, 193 anomalous teeth were observed. The most commonly affected tooth was the primary maxillary lateral incisor (35.2%), closely followed by the permanent maxillary lateral incisor (32.6%). The other affected teeth in decreasing frequency were permanent maxillary central incisor (17.6%), primary maxillary central incisor (10.4%), primary maxillary canine (2.6%) and permanent maxillary canine (1.5%)

Table4. Comparison Of Anomalies Between Unilateral And Bilateral Cleft Lip And Palate

Type of anomaly	Cleft type UCLP(N=56) N	%	BCLP (N=37) N	%	Level Of Significance
Agenesis	25	44.6	17	45.9	NS
Rotation	13	23.2	07	18.9	NS
Ectopic eruption	14	25	09	24.3	NS
Supernumerary tooth	08	14.3	06	16.2	NS
Microdontia	07	12.5	4	10.8	NS
Enamel hypoplasia	03	05.4	4	10.8	NS

DISCUSSION

Individuals with orofacial cleft demonstrate a high incidence of developmental dental disturbances compared with the general population.[12,13,15,17-19]. In this study, we observed 86.6% of the cleft population with at least one dental anomaly. This is comparable with the findings of Al-Kharboush et al,[1] (91.4%), Nicholls[3] (94%), Sá et al,[17] (88.2%) but higher than the results of Al Jamal et al[20] (66.7%), Aizenbud et al[21] (67.6%) and Menezes and Vieira[6] (32.2%). The variation in prevalence could be attributed to the differences in populations, sample size differences, type and severity of cleft, the inclusion of specific dental anomaly and type of dentition involved.

Baek and Kim[22] (2007) stressed the importance of a classification of cleft types since the cleft phenotype might affect the pattern of developmental dental disturbances. In our study, the cleft subjects were subdivided into four groups and the most frequent cleft subtype was ULCLP (37.5%) which is three times more frequent than the URCLP (12.5%). This is in agreement with the results of Dewinter et al.,[11] (2003) and Akcam et al.,[12] (2010), Qureshi et al.,[23] (2012) and Shapira et al[24] (2014) who also reported that the left-sided cleft was more prevalent than the right-sided cleft. This is probably due to the greater blood supply to the right side of the face than on the left side.

Pedro et al.,[25] (2012) investigated the cleft type distribution by gender and observed a higher prevalence of complete ULCLP and complete BCLP in males and isolated CP in females. Letra et al,[8] (2007), and Menezes and Vieira[6],(2008) also noted similar findings. In contrast with their observations, our analysis did not reveal any significant difference in the distribution of cleft subtypes and gender. Moreover, the results of the present study found no relationship between dental anomalies and gender. This is in contrast with the finding of Wangsrimongkol et al,[26] who reported a gender- dependent pattern in tooth agenesis in cleft population but supports the results of Ribeiro et al.[27] (2003), Akcam et al[12] 2010), Al-Kharboush et al[1] (2015) and Konstantonis et al[28] (2017). These investigators also observed no significant differences in dental anomalies between genders.

Some studies have reported a correlation between severity of cleft and frequency of dental anomalies. For instance, Menezes and Vieira[6] (2008) reported that patients with CP were more affected by dental anomalies than were individuals with CL or CLP. Individuals with isolated CL type exhibit fewer dental anomalies as there is less amount of mesenchymal tissue deficiency. Some investigators have observed that the occurrence of tooth agenesis is directly proportional whereas supernumerary tooth is inversely proportional to the extent of the cleft.[14,29] Paranaiba et al[19] (2013), however, showed that dental anomalies were more common in individuals with unilateral CLP than with bilateral CLP. Sá et al[17] (2016) also made a similar observation. On the other hand, Rullo et al[13] (2015) observed that the number of dental anomalies was not correlated with the severity of the cleft. Our results also showed that the frequency of anomalies did not differ significantly between UCLP and BCLP cases. Therefore, further studies are required to sort out this controversy.

Consistent with previous reports, the present study showed that tooth agenesis was the most frequently occurring dental anomaly in the cleft population. In the present investigation, 43.8% of the study population exhibited agenesis of the tooth and congenital absence of the maxillary lateral incisor was the most common finding. This is comparable with the results of Stahl et al[30] (46.6%) and Sá et al[17] (45.9%), but higher than the finding of a study which reported a 4.7% prevalence of hypodontia in the Bengali population.[31] Aizenbud et al[21] (67.7%) Shapira et al[24] (77%) and Tereza et al[4] (70.2%) have reported a greater prevalence of tooth agenesis in the cleft individuals. The difference in prevalence is probably due to the inclusion of tooth agenesis outside the cleft area in some studies. For instance, Letra et al.[8],(2007), Menezes and Vieira,[8] (2008) and Pedro et al[25] (2012) did not include tooth agenesis in the cleft area.

In agreement with the current literature, the present study showed that maxillary lateral incisor is the most commonly missing teeth in patients with CLP. Akcam et al[12] (2010) postulated that the lateral incisor tooth bud may be damaged secondary to surgical repair of palate. In addition, deficiency of the mesenchymal tissue and compromised blood supply in the cleft region may also adversely affect tooth development. Ribeiro et al[27].,(2003), and many other investigators have observed that tooth agenesis is approximately four times more common in individuals with CLP than in the general population. In this study, tooth agenesis did not differ significantly between UCLP and BCLP. This is in contrast with the results of Qureshi et al[23] (2012) who observed that single tooth agenesis was more frequent in UCLP subjects, whereas agenesis of multiple teeth

was more frequent in BCLP children. Previous studies have related MSX1, TGFA, PAX9, FGFR1, andIRF6, genes related to oral clefts, are associated with isolated tooth agenesis.[32]

Ectopic eruption is considered a positional anomaly and occurs due to local as well as systemic factors.[34] Its prevalence in the general population ranges from 1.5 to 2% for the permanent canine.[12,13] In this study ectopic eruption of the tooth was the second most common dental anomaly accounting for 22.3% of cases. This is higher than the findings of Rullo et al.,[13] (2015, 18.9%), Al-Kharboush et al[1] (2015, 12.3%), Sá et al.,[17] (2015, 3.8%), and Costa et al[33] (2012, 5.3%) The difference in prevalence could be due to inclusion of dental transposition by some investigators as a separate group of anomaly.

Rotation of tooth accounted for 21.4% of cases in the current study. This is higher than the result of Costa et al.,[33] (13.2%), but comparable with the result of Sá et al.,[17](2015, 20%), and Rullo et al.,[13] (2015, 25%). Moreover, in agreement with the observation of Sá et al.,[17] (2015) our study also showed that rotation is more prevalent in UCLP cases. Smahel et al[34] (1996) concluded that insufficient space is a probable cause of rotation adjacent to the cleft. Meazzini et al.,[35] instead, related rotation of tooth as a consequence of the surgery carried out to repair the cleft.

Prevalence of supernumerary tooth range from 0.3 to 3.8 percent in the general population.[36] In this study, we observed a high frequency (16%) of this anomaly which is in agreement with the findings of Costa et al.,[33] (13.2%) and Al –Jamal et al.,[20](16.7%). Nicholls[3] suggests that supernumeraries in CLP patients arise during cleft formation from fragmented dental lamina. Microdontia is another anomaly frequently seen in patients with CLP. Lygstadaas et al.,[37](1996) and Pinho et al[38] 2005) observed that microdontia is the partial expression of the same genetic defect that results in tooth agenesis. In this study, this anomaly was found in 10.7% of cases which is comparable with the result of Sá et al[17] (18.4%).

Ruiz et al,[39] have noted a high percentage of enamel defects in the cleft side and suggest that the cleft may cause enamel hypoplasia. The overall incidence of enamel hypoplasia is 7.1% in this study which is comparable with the result of Nicholls who observed it in 6% of children with cleft lip and palate in Western Australia.

CONCLUSIONS

The results of this study showed that 86.6% of patients with orofacial cleft were found to have at least one dental anomaly. Tooth agenesis (43.8%) was the most common dental anomaly and most frequently affected tooth was the primary maxillary lateral incisor (35.2%). Although a high prevalence of dental anomalies was observed in children with unilateral and bilateral cleft lip and palate, no significant difference was observed among cleft sub-types.

REFERENCES

1. Al-Kharboush GH, Al-Balkhi KM, Al-Moammar K. The prevalence of specific dental anomalies in a group of Saudi cleft lip and palate patients. Saudi Dent J 2015;27:75-80
2. Haque S, Alam MK. Common Dental Anomalies in Cleft Lip and Palate Patients. Malay J Med Sci 2015;22:55-60.
3. Nicholls W. Dental anomalies in children with cleft lip and palate in Western Australia. Euro J Dent 2016;10:254-258
4. Tereza GP, Carrara CF, Costa B. Tooth abnormalities of number and position in the permanent dentition of patients with complete bilateral cleft lip and palate. Cleft Palate Craniofac J 2010;47:247–252.
5. Pegelow M, Alqadi N, Agneta, Karsten AL. The prevalence of various dental characteristics in the primary and mixed dentition in patients born with non-syndromic unilateral cleft lip with or without cleft palate. Euro J Orthod 2011; 34: 561-570.
6. Menezes R, Vieira AR. Dental anomalies as part of the cleft spectrum. Cleft Palate Craniofac J 2008; 45:414-9.
7. Hovorakova M, Lesot H, Peterkova R, Peterka M. Origin of the deciduous upper lateral incisor and its clinical aspects. J Dent Res 2006;85:167–171
8. Letra A, Menezes R, Granjeiro JM, Vieira AR. Defining subphenotypes for oral clefts based on dental development. J Dent Res 2007; 86:986-91.
9. Tannure PN, Oliveira CA, Maia LC, Vieira AR, Granjeiro JM, de Castro Costa M. Prevalence of dental anomalies in nonsyndromic individuals with cleft lip and palate: a systematic review and meta-analysis. Cleft Palate Craniofac J 2012; 49: 194-200.
10. Baek SH, Kim NY. Congenital missing permanent teeth in Korean unilateral cleft lip and alveolus and unilateral cleft lip and palate patients. Angle Orthod 2007; 77:88-93
11. Dewinter G, Quirynen M , Heidbuchel K, Verdonk A, Willems G. Dental abnormalities, bone graft quality, and periodontal conditions in patients with unilateral cleft lip and palate at different phases of orthodontic treatment. Cleft Palate Craniofac J 2003 40:343–350
12. Akcam MO, Evirgen S, Uslu O, Memikoğlu UT. Dental anomalies in individuals with cleft lip and/or palate. Eur J Orthod. 2010 32:207-13
13. Rullo R, Festa VM, Rullo R, et al. Prevalence of dental anomalies in children with cleft lip and unilateral and bilateral cleft lip and palate. Eur J Paediatr Dent 2015;16:229–232.
14. Lopes LD, Mattos BS, Andre M. Anomalies in number of teeth in patients with lip and/or palate clefts. Braz Dent J 1991;2:9–17.
15. Vichi M, Franchi L. Abnormalities of the maxil- lary incisors in children with cleft lip and palate. J Dent Child 1995;62:412-7
16. Larson M, Hellquist R, Jakobsson OP. Dental abnormalities and ectopic eruption in patients with isolated cleft palate. Scand J Plast Reconstr Surg Hand Surg 1998;32:203-212.
17. Sá J, Araújo L, Guimarães L, Maranhão S, Lopes G, Medrado A, Coletta R, Reis S. Dental anomalies inside the cleft region in individuals with nonsyndromic cleft lip with or without cleft palate. Med Oral Patol Oral Cir Bucal 2016;21:e48-52
18. Kuchler EC, Risso PA, Costa Mde C, Modesto A, Vieira AR. Studies of dental anomalies in a large group of school children. Arch Oral Biol 2008;53:941–946.
19. Paranaíba LMR, Coletta RD, Swerts MSO, Quintino RP, Barros LM, Martelli-Júnior H. Prevalence of Dental Anomalies in Patients With Nonsyndromic Cleft Lip and/or Palate in a Brazilian Population. Cleft Palate Craniofac J 2013; 50:400-5.
20. Al Jamal GA, Hazza'a AM, Rawashdeh MA. Pre- valence of dental anomalies in a population of cleft lip and palate patients. Cleft Palate Craniofac J 2010;47:413-20.
21. Aizenbud D, Camasuvi S, Peled M, Brin I. Congenitally missing teeth in the Israeli cleft popu- lation. Cleft Palate Craniofac J 2005;42:314-7.
22. Baek S H, Kim N Y. Congenital missing permanent teeth in Korean unilateral cleft lip and alveolus and unilateral cleft lip and palate patients. Angle Orthodontist2007; 77: 88–93
23. Qureshi WA, Beiraghi S. Leon-Salazar V. Dental Anomalies Associated With Unilateral and Bilateral Cleft Lip and Palate. J Dent Child 2012;79:69-73
24. Shapira Y, Haklai Z, Blum I, Shpack N, Amitai Y. Prevalence of non-syndromic orofacial clefts among Jews and Arabs, by type, site, gender and geography: a multi-centre study in Israel. Isr Med Assoc J 2014;16:759-763
25. de Lima Pedro R, Faria MD, de Castro Costa M, Vieira AR. Dental anomalies in children born with clefts: a case-control study. Cleft Palate Craniofac J 2012;49:e64-8.
26. Wangsrimongkol T, Manosudprasit M, Pisek P, Chittiwatanapong N. Prevalence and types of dental anomaly in a Thai non-syndromic oral cleft sample. J Med Assoc Thai. 2013;96:S25–35
27. Ribeiro L L, DasNeves L T, Costa B, Gomide M R 2003 Dental anomalies of the permanent lateral incisors and prevalence of hypodontia outside the cleft area in complete unilateral cleft lip and palate. Cleft Palate Craniofac J 2003; 40: 172–175
28. Konstantonis D, Alexandropoulos A, Konstantoni N, Nassika M. A cross-sectional analysis of the prevalence of tooth agenesis and structural dental anomalies in association with cleft type in non-syndromic oral cleft patients. Prog Orthod. 2017;18:20
29. Ranta R. A review of tooth formation in children with cleft lip and palate. Am J Orthod Dentofac Orthop1986; 90: 11–17
30. Stahl F, Grabowski R, Wigger K. Epidemiology of Hoffmeister's "genetically determined predisposition to disturbed development of the dentition" in patients with cleft lip and palate. Cleft Palate Craniofac J, 2006; 43: 457-465.
31. Mukhopadhyay S, Mukhopadhyay P, Sarkar S, Ghosh C, Kar S. Prevalence and distribution of hypodontia in a group of Bengali pediatric population. J Cranio Maxillary Dis 2015;4:28-32.
32. Vieira AR, Modesto A, Marazita ML. Caries: review of human genetics research. Caries Res 2014; 48: 491-506.
33. Costa CH, Diniz LV, Lacerda RH, Forte FD, Sampaio FC. Prevalence of dental anomalies in patients with cleft lip and palate, Paraiba, Brazil: clinic and radiographic study. Acta Odontol Latinoam. 2012;25:181–185
34. Šmahel Z, Müllerová Ž, Nejedlý A. Effect ofprimary repositioning of the nasal septum on facial growth in unilateral cleft lip and palate.The Cleft Pal Craniofac J 1999; 36: 310-3. Tortora C, Meazzini MC, Garattini G, Brusati R. Prevalence of abnormalities in dental structure, position, and eruption pattern in a population of unilateral and bilateral cleft lip and palate patients. Cleft Palate Craniofac J 2008;45:154-62.
35. Meazzini MC, Tortora C, Morabito A, Garattini G, Brusati R. Alveolar bone formation in patients with unilateral and bilateral cleft lip and palate after early secondary gingivoalveoloplasty: long-term results. Plast Reconstr Surg 2007;119:1527-1537.
36. Liu JF. Characteristics of premaxillary supernumerary teeth: A survey of 112 cases. ASDC J dent child 1995;62:262-5.
37. Vastardis H, Karimbux N, Guthua SW, Seidman JG, Seidman CE. A human MSX1 homeodomain missense mutation causes selective tooth agenesis. Nat Genet 1996;13:417-421.
38. Pinho T., Tavares P., Maciel P., Pollmann C. Developmental absence of maxillary lateral incisors in the Portuguese population. Eur J Orthod 2005;27:443–449
39. Ruíz LA, Maya RR, D'Alpino PHP, Atta MT, Svizero NR. Prevalence of enamel defects in permanent teeth of patients with complete cleft lip and palate. Cleft Palate Craniofac J2013;50:394-9.