

Prevalence and Types of Dental Anomaly in a Thai Non-Syndromic Oral Cleft Sample

Tasaneew Wangsrimongkol DDS, MS, PhD*, Montian Manosudprasit DDS, MDS*,
Poonsak Pisek DDS*, Nisa Chittiwatanapong DDS*

* Department of Orthodontics, Faculty of Dentistry, Khon Kaen University, Khon Kaen, Thailand

Objective: To investigate the prevalence and characteristics of dental anomalies (DAs); missing teeth (MT), dens-evaginatus (D-E), dens-invaginatus, dilaceration, fusion, gemination, macrodontia, microdontia (Micro), supernumerary teeth (SNT), and taurodontism, in permanent teeth among subjects with non-syndromic oral cleft.

Material and Method: This cross-sectional study was designed to assess DAs from diagnostic records; comprising panoramic radiograph, intraoral photographs, dental casts, and orthodontic clinic charts of 280 Northeastern Thai subjects, mean age 10.3 ± 3.2 years. Chi-square test was used to compare DA prevalences among cleft phenotypes and genders.

Results: There were one or more teeth with DAs in 89.6% of the study population. Highest prevalence was MT (60.4%) followed by Micro (41.4%), dilaceration (6.4%), SNT (6.1%), and 0.4% in D-E, fusion, gemination, and taurodontism. The most prevalent MT was found in 70.7% of subjects in bilateral cleft lip and palate group.

Conclusion: The two predominant DAs were MT and Micro, higher prevalences being found with the more severe cleft conditions. The most affected teeth were cleft-site lateral incisors. There were no differences in distribution of DA in male and female.

Keywords: Cleft lip, Cleft palate, Dental anomaly, Prevalence, Thai

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Patients with cleft lip and/or cleft palate (CL/P) often have skeletal problems of deficient maxilla and dento-alveolar malocclusion⁽¹⁻⁵⁾. Orthodontic treatment planning requires pre-treatment data based on underlying skeletal and dental components causing malocclusion; and, importantly, this also includes the occurrence of dental anomalies (DAs). When compared with the general population, subjects with a cleft lip and palate (CLP) have been found to have a higher prevalence of DAs, including variations in tooth number and position, and reduced tooth dimensions, most of which are localized in the area of the cleft defect⁽⁶⁻⁸⁾. This emphasizes the possibility of DAs as aggravating dental problems in cleft lip and palate population. There have been a few studies of DAs in Thai subjects^(9,10), but none of them has reported on an oral cleft population.

The objectives of the present study were to investigate the characteristics and prevalence of DAs; missing teeth, dens-evaginatus, dens-invaginatus,

dilaceration, fusion, gemination, macrodontia, microdontia, supernumerary teeth and taurodontism, among all permanent teeth, excepting third molars in Thai non-syndromic oral cleft groups. The current study also aimed to compare the occurrences of these DAs among cleft phenotypes and genders. The oral cleft subjects attended the Khon Kaen Cleft Center associated with the "Tawanchai Project" which was developed to honor Her Royal Highness Princess Maha Chakri Sirindhorn.

Material and Method

This was a cross-sectional study of 280 Thai non-syndromic cleft lip and/or cleft palate patients who attended the Tawanchai Cleft Center (TCC) between 1990 and 2011. All subjects met the following requirements: Northeastern Thailand origin, with standardized diagnostic records, and no history of permanent teeth extraction, endodontic, prosthodontic, or orthodontic treatments within the age range 4 to 17 years, the initial age corresponding to the expected radiographic sign of commencing calcification of all teeth including second permanent molars. Standardized records comprised of panoramic radiograph, intraoral photographs, dental casts, and orthodontic clinic charts but intraoral radiographs such as periapical or occlusal

Correspondence to:

Wangsrimongkol T, Department of Orthodontics, Faculty of Dentistry, Khon Kaen University, Muang, Khon Kaen 40002, Thailand.

Phone & Fax: 043-202-863

E-mail: Tasaneew@kku.ac.th

radiographs were available for some and these films were taken by same standardized method. In subjects who had serial radiographs, the most recent radiographic record of each subject was assessed. The cleft phenotypes and sidedness were determined by orthodontic clinic chart.

Missing teeth, dens-evaginatus, dens-invaginatus, dilaceration, fusion, gemination, macrodontia, microdontia, supernumerary teeth, and taurodontism were assessed through radiographic evaluation, tooth size measurement on dental casts, and orthodontic chart. Those ten types of DAs in permanent teeth, excluding third molars, were considered as the described by Langland et al⁽¹¹⁾;

- Missing teeth: congenital absence of one tooth or more,
- Dens-evaginatus: outfolding of the enamel organ on the occlusal surface of premolar teeth, and the cingulum of anterior teeth,
- Dens-invaginatus: infolding of the occlusal tooth surface towards the pulp of premolar teeth, and cingulum of anterior teeth,
- Dilaceration: a bent tooth – angulated or sharply bent roots or root tips,
- Fusion: union of two adjacent tooth buds by dentin and/or enamel and reduction in number of teeth in the arch,
- Gemination: incomplete separation or splitting of a single tooth bud, usually expressed as enlarged crown with incisal notching, and occurring in the normal total number of teeth in the arch,
- Macrodontia: larger size than normal,
- Microdontia: smaller size than normal,
- Supernumerary teeth: one or more extra teeth,
- Taurodontism: tooth with abnormally large pulp and shortened roots, rectangular pulp chamber, lack of usual cervical constriction.

The mesio-distal width of each permanent tooth was assessed based on comparison with the tooth width ranges for 290 Khon Kaen subjects reported by Wangchuk⁽¹²⁾. Additionally, the average

width of the maxillary and mandibular second molars in Thais were obtained from the study of Patanaporn⁽¹³⁾ (Table 1).

The data collection was performed by a single examiner. Before the data collection, the intra-examiner reliability was tested. Intra-examiner reliability for DAs assessment was performed on two occasions two weeks apart. The same results were found between the two trials, indicating good reliability, and then the full DAs investigation was established.

DAs were observed in each cleft phenotype according to the presence and type of oral cleft and affected sides;

- Cleft lip (CL): only the lip was affected,
- Cleft lip and alveolus (CLA): the lip and alveolar process were affected, the palate was normal,
- Unilateral cleft lip and palate (UCLP): lip, alveolar process and palate were affected unilaterally,
- Bilateral cleft lip and palate (BCLP): lip, alveolar process and palate were affected bilaterally,
- Cleft palate (CP): only the palate was affected, including submucous to complete cleft palate.

This research project received approval from the Khon Kaen University Ethics Committee for Human Research (HE552106).

Statistical analysis

Kappa statistic was used to test intra-examiner reliability in a single examiner (Table 2). Descriptive statistics (mean, frequency, and percent) were used for prevalence rate and reporting frequencies of DAs in different oral cleft groups. The Chi-square test and the exact binomial test were used to compare the frequency of each DA category among cleft phenotypes and genders. Statistical analysis was performed with the Statistical Package for Social Science Version 18.0 for Windows (SPSS, Inc., Chicago, Illinois, USA).

Results

In the total 280 non-syndromic oral cleft

Table 1. Range of normal tooth width used in the current study assessment (From Wangchuk⁽¹²⁾ and Patanaporn⁽¹³⁾)

Permanent teeth	Range of normal tooth width (mm)						
	Central incisor	Lateral incisor	Canine	First premolar	Second premolar	Firstmolar	Second molar
Maxillary teeth	7.10-8.98	5.47-7.59	6.42-8.46	6.09-7.85	5.38-7.38	8.71-10.67	8.62-10.82
Mandibular teeth	3.89-5.37	4.67-6.19	5.55-7.31	6.01-7.77	5.67-7.79	9.62-12.02	9.75-12.55

subjects, there were 139 males and 141 females with mean age of 10.3±3.2 years. Demographic data of age, gender, and cleftphenotypes are summarized in Table 3.

89.6% (n = 251) of CL/P subjects were affected

Table 2. Intra-examiner reliability test for tooth morphology determination

Tooth	% agreement	Kappa	p-value
#11	96%	0.8344	<0.001
#12	92%	0.8162	<0.001
#13	96%	0.8649	<0.001
#14	96%	0.8344	<0.001
#15	96%	0.8837	<0.001
#16	100%	0.7788	<0.001
#17	100%	-	NA
#21	96%	0.7788	<0.001
#22	92%	0.8264	<0.001
#23	100%	1	<0.001
#24	100%	1	<0.001
#25	96%	0.9049	<0.001
#26	100%	1	<0.001
#27	100%	-	NA
#31	100%	-	NA
#32	100%	1	<0.001
#33	100%	1	<0.001
#34	100%	1	<0.001
#35	100%	1	<0.001
#36	100%	1	<0.001
#37	100%	1	<0.001
#41	100%	-	NA
#42	96%	0.8344	<0.001
#43	100%	-	NA
#44	100%	1	<0.001
#45	100%	1	<0.001
#46	100%	-	NA
#47	100%	-	NA

= FDI Two-digit notation tooth numbering system; NA = not available due to without dental anomaly

Table 3. Distribution of cleft phenotypes, gender, and average age in each group

Gender	CL			CLA			UCLP		BCLP	CP	Total
	Rt	Lt	B	Rt	Lt	B	Rt	Lt			
Male	-	2	-	7	11	2	24	51	39	3	139
Female	-	5	-	7	14	5	19	46	36	9	141
Total (cases)		7			46		140	75		12	280
Mean age (years)		7.9±2.5		10.6±2.8			10.4±3.4		10.2±3.1	9.2±2.0	10.3±3.2

Rt = right side; Lt = left side; B = bilateral sides

with at least one type of DAs. Prevalences of DAs among this oral cleft population are shown in Fig. 1. Missing teeth was the most prevalent anomaly (60.4%), followed by microdontia (41.4%), dilaceration (6.4%), supernumerary teeth (6.1%), and less than 1% (one subject each) for dens-evaginatus, fusion, gemination, and taurodontism.

DAs in each cleft group were summarized in Table 4. There were no subjects affected by dens-invaginated or macrodontia, while missing teeth, microdontia, supernumerary teeth, and dilaceration were found in most cleft groups with highest frequency in the CLP group. The two lowest frequencies of abnormality in tooth number and tooth morphology were with UCL/L and CP.

On the contrary, the most numbers of affected teeth were found in the UCLP/L group. The less severe the oral cleft (CP, CLA and CL), the less the variety of DAs that was observed. It will be noted that, although 29 subjects had no anomalies, the numbers of DAs and affected teeth are both greater than the total number of subjects (280), indicating multiple occurrences of some anomalies in the same tooth, as well as affecting more than one tooth of some subjects (Fig. 1 and Table 4).

However, there was no DA detected in teeth #17, #31, #37, #43, and #47 among any of the 280

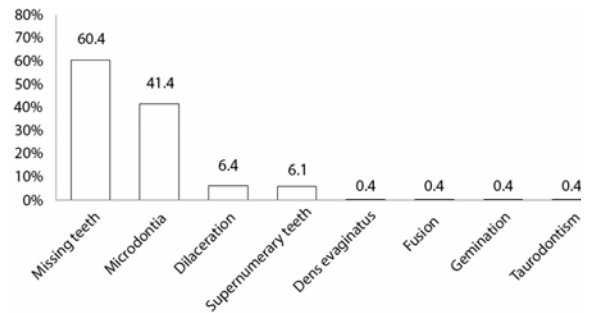


Fig. 1 Prevalence of dental anomalies among the cleft sample.

Table 4. Frequency of dental anomalies by numbers of teeth (t) and subjects (n) affected, stratified by cleft phenotypes

Cleft groups	UCL/L		CLA				UCLP		BCLP		CP		Totals					
			Rt		Lt		B		Rt		Lt							
	t	n	t	n	t	n	t	n	t	n	t	n	t	n				
Missing teeth	4	3	6	6	9	9	6	4	60	29	103	62	106	53	4	3	298	169
Microdontia	-	-	7	6	17	17	10	6	20	18	38	36	48	32	1	1	141	116
Dilaceration	1	1	-	-	5	3	-	-	1	1	16	6	7	6	2	1	32	18
Supernumerary teeth	1	1	2	1	3	3	1	1	1	1	3	3	7	7	-	-	18	17
Taurodontism	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	2	1
Fusion	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	1
Dens-egarginatus	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	1	1
Gemination	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Totals	6	4	15	12	32	25	17	7	85	40	158	88	165	72	7	3	485	251

Rt = right side, Lt = left side, B = bilateral sides

subjects. The percentages of subjects without a DA in each oral cleft group were 75% of CP (n = 9), 42.9% of UCL/L (n = 3), 14.3% of UCLA/R (n = 2), 8.6% of UCLP/L (n = 12), and 4% of BCLP (n = 3).

There was nearly equal distribution of males and females having DAs (Table 5). Chi-square test confirmed no statistically significant difference in males and females with missing teeth (p = 0.827; difference 1.3%, 95% CI: -12.7% to 10.2%), microdontia (p = 0.731; difference 2%, 95% CI: -9.5% to 13.5%), dilaceration (p = 0.648; difference 1.3%, 95% CI: -7.1% to 4.5%), and supernumerary teeth (p = 0.471; difference 2.1%, 95% CI: -7.7% to 3.5%).

BCLP subjects were the most affected with missing teeth of 70.7% prevalence (Table 6). Among CLP subjects with missing teeth, there was no significant difference; BCLP and UCLP/R (p = 0.714; difference 3.23%, 95% CI: -20.62% to 14.16%), BCLP and UCLP/L (p = 0.351; difference 6.75%, 95% CI: -20.80% to 7.30%), UCLP/R and UCLP/L (p = 0.867; difference 3.52%, 95% CI: -13.44% to 73.49%), but greater impact of missing teeth in CLP over CLA were significant: CLA and UCLP/R (p = 0.013; difference 26.14%, 95% CI: 6.17% to 46.11%), CLA and UCLP/L (p = 0.011; difference 22.62%, 95% CI: 5.48% to 39.76%), CLA and BCLP (p = 0.001; difference 29.37%, 95% CI: 11.80% to 46.94%).

The oral cleft subjects had significantly more missing maxillary teeth than mandibular teeth (p < 0.001; difference 51.43%, 95% CI: 44.89% to 57.97%), particularly in UCLP and BCLP groups. There was no patient with missing mandibular teeth in UCL and UCLA, as shown in Table 6. In BCLA and CP groups, single patients with missing mandibular teeth were detected.

Absence of maxillary lateral incisors and second premolars, the most and second significant missing teeth, respectively, affected all cleft groups (Table 7). The prevalence of missing maxillary lateral incisors in the cleft site among UCL/P and UCLA subjects was greater compared with the contralateral side. The most frequently missing tooth was #12 in 42.9% of UCLA/R and 30.2% UCLP/R, while absence of #22 occurred in 42.9% of UCL/L, 32% of UCLA/L, and 39.2% of UCLP/L. However, no CP subjects had any missing maxillary lateral incisors, but one CP subject exhibited missing bilateral maxillary second premolars. The prevalence of missing maxillary second premolars was highest in the UCLP/R (25.6%), followed by UCLP/L (15.5%) and BCLP (10.7%).

Microdontia, the second most common DA, was detected in 116 oral cleft subjects, but none in the

Table 5. Distribution of dental anomaly by gender. (Numbers represent affected subjects)

Gender	MT	Micro	Dila	SNT	D-E	F	GM	TD
Male (n = 139)	83	59	8	7	-	1	1	1
Female (n = 141)	86	57	10	10	1	-	-	-
Total (n = 280)	169	116	18	17	1	1	1	1

D-E = dens-evaginatus, Dila = dilaceration, F = fusion, GM = gemination, Micro = microdontia, MT = missing teeth, SNT = supernumerary teeth, TD = taurodontism, n = total subjects in each group

Table 6. Distribution of missing teeth in each cleft groups, for maxillary and mandibular arches

Cleft groups	Missing teeth					
	Maxillary teeth		Mandibular teeth		Total	
	n	%	n	%	n	%
UCL/L (N = 7)	3	42.9	-	-	3	42.9
UCLA/R (N = 14)	6	42.9	-	-	6	42.9
UCLA/L (N = 25)	9	36.0	-	-	9	36.0
BCLA (N = 7)	4	57.1	1	14.3	4	57.1
UCLP/R (N = 43)	28	65.1	7	16.3	29	67.4
UCLP/L (N = 97)	60	61.2	4	4.1	62	63.9
BCLP (N = 75)	51	68.0	8	10.7	53	70.7
CP (N = 12)	2	16.7	1	8.3	3	25.0
Total (N = 280)	163	58.2	21	7.5	169	60.4

N = total subjects in each group, n = numbers of affected subjects in each cleft phenotype

CL group (Table 8). There were differences among the CL/P groups ($p = 0.004$). A multi-pair test found difference only between UCLA/L and CP, while the other cleft groups were not significantly different. The prevalences of microdontia distributed among oral cleft phenotypes were 85.7% of BCLA, 68% of UCLA/L, 42.9% of UCLA/R, 42.7% of BCLP, 41.9% of UCLP/R, 37.1% of UCLP/L, and 8.3% of CP. The cleft-site lateral incisors were the most affected teeth.

Dilaceration was detected in 30 teeth of 18 oral cleft subjects but none in UCLA/R or BCLA. Dilaceration affected only a few maxillary and mandibular with highest frequency in maxillary left teeth, as shown in Table 9.

The most commonly found supernumerary teeth location was the maxillary left anterior teeth segment (#21-#23), which affected 12 oral cleft subjects (4.3%), as presented in Table 10. Supernumerary teeth had minor impact among CL/P groups; 14.3% of each UCL/L and BCLA subjects ($n = 1$), 12% of UCLA/L subjects ($n = 3$), less than 10% in all CLP groups. None of the CP subjects was affected by supernumerary

teeth.

Dens-evaginatus, fusion, gemination and taurodontism all occurred with the same prevalences of 0.4% ($n = 1$). In UCLP/R group, there was one female subject with dens-evaginatus of her cleft-site lateral incisor (#12) and one male subject with taurodontism of teeth #16 and #26. One UCLP/L male had fusion of teeth in the mandibular left anterior segment (#32 and #33). Gemination was observed in tooth #11 of one BCLP male.

Discussion

Comparing various reports (Table 11), there were 89.6% of the oral cleft group at the Tawanchai Cleft Center affected with at least one DA in permanent teeth (third molars excluded), which was close to the percentage of Wong et al⁽¹⁴⁾ (87.9%). Ackam et al⁽¹⁵⁾ reported a higher prevalence of 96.7%. The types of DA in their study surprisingly included more variety of DAs; dens-invaginatus, dens-evaginatus, dilaceration, ectopic eruption, enamel hypoplasia, impaction, microdontia, missing teeth, pulp stone, short/blunt

Table 7. Distribution of missing maxillary lateral incisors and second premolars, according to right, left and bilateral sides

Missing teeth	Maxillary lateral incisors						Maxillary second premolars							
	#12		#22		#12 and #22		#15		#25		#15 and #25		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
UCL/L	-	-	3	42.9	-	-	3	42.9	-	-	-	-	-	-
UCLA/R	6	42.9	-	-	-	-	6	42.9	-	-	-	-	-	-
UCLA/L	1	4.0	8	32.0	-	-	9	36.0	-	-	-	-	-	-
BCLA	1	14.3	1	14.3	1	14.3	3	42.9	-	-	-	-	-	-
UCLP/R	13	30.2	6	14.0	5	11.6	24	55.8	4	9.3	3	7.0	11	25.6
UCLP/L	2	2.1	38	39.2	14	14.4	54	55.7	7	7.2	6	6.2	2	2.1
BCLP	15	20.0	15	20.0	18	24.0	48	64	4	5.3	2	2.7	2	2.7
CP	-	-	-	-	-	-	-	-	-	-	-	-	1	8.3
Total	38	13.6	71	25.4	38	13.6	147	52.5	15	5.4	12	4.3	8	2.9

= FDI Two-digit notation tooth numbering system, N = Total subjects in each group, n = numbers of affected subjects in each cleft phenotype

Table 8. Distribution of microdontia and cleft phenotypes

Microdontia	UCLA/R (N = 14)		UCLA/L (N = 25)		BCLA (N = 7)		UCLP/R (N = 43)		UCLP/L (N = 97)		BCLP (N = 75)		CP (N = 12)		Total (N = 280)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
#12	4	28.6	1	4.0	1	14.3	14	32.6	7	7.2	8	10.7	1	8.3	36	12.9
#12 & #22	1	7.1	-	-	4	57.1	1	2.3	2	2.1	16	21.3	-	-	24	8.6
#12 & #15	-	-	-	-	-	-	1	2.3	-	-	-	-	-	-	1	0.4
#13	-	-	-	-	-	-	-	-	1	1.0	-	-	-	-	1	0.4
#15	-	-	-	-	-	-	-	-	1	1.0	-	-	-	-	1	0.4
#22	1	7.1	16	64.0	1	14.3	2	4.7	25	25.8	8	10.7	-	-	53	18.9
Total	6	42.9	17	68.0	6	85.7	18	41.9	36	37.1	32	42.7	1	8.3	116	41.4

= FDI Two-digit notation tooth numbering system, N = Total subjects in each group, n = numbers of affected subjects in each cleft phenotype

Table 9. Distribution of dilaceration in oral cleft phenotypes

Dilaceration	UCL/L (N = 7)		UCLA/L (N = 25)		UCLP/R (N = 43)		UCLP/L (N = 97)		BCLP (N = 75)		CP (N = 12)		Total (N = 280)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
#12	-	-	-	-	-	-	1	2.3	-	-	-	-	1	0.4
#14	-	-	-	-	-	-	1	2.3	1	1.0	-	-	2	0.7
#16	-	-	-	4.0	1	-	-	-	-	-	-	-	1	0.4
#21	-	-	1	7.1	-	-	-	-	1	1.0	-	-	2	0.7
#22	-	-	1	7.1	-	-	-	-	2	2.1	-	-	3	1.1
#23	-	-	-	-	-	-	1	2.3	-	-	-	-	1	0.4
#24	-	-	-	-	-	-	2	4.7	-	-	-	-	2	0.7
#25	-	-	1	7.1	-	-	1	2.3	-	-	-	-	2	0.7
#32	-	-	-	-	-	-	1	2.3	-	-	-	-	2	0.7
#34	1	14.3	-	-	-	-	3	7.0	-	-	-	-	4	1.4
#35	-	-	-	-	-	-	2	4.7	1	1.0	-	-	3	1.1
#41	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4
#42	-	-	-	-	-	-	-	-	2	2.1	-	-	2	0.7
#45	-	-	2	14.3	-	-	2	4.7	-	-	-	-	4	1.4
Total	1	14.3	3	12.0	1	2.3	6	6.2	6	8.0	1	8.3	18	6.4

= FDI Two-digit notation tooth numbering system, N = Total subjects in each group, n = numbers of affected subjects in each cleft phenotype

Table 10. Distribution of supernumerary teeth in oral cleft phenotypes

Supernumerary teeth	UCL/L (N = 7)		UCLA/R (N = 14)		UCLA/L (N = 25)		BCLA (N = 7)		UCLP/R (N = 43)		UCLP/L (N = 97)		BCLP (N = 75)		Total (N = 280)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
#11-#13	-	-	1	7.1	-	-	-	-	-	-	-	-	4	5.3	5	1.8
#21-#23	1	14.3	1	7.1	3	12	1	14.3	1	2.3	3	3.1	2	2.7	12	4.3
#36	-	-	-	-	-	-	-	-	-	-	-	-	1	1.3	1	0.4
Total	1	14.3	1	7.1	3	12	1	14.3	1	2.3	3	3.1	7	9.3	17	6.1

= FDI Two-digit notation tooth numbering system, N = Total subjects in each group, n = numbers of affected subjects in each cleft phenotype

Table 11. Percentage of the dental anomalies in oral cleft subjects

Authors	N	≥ one DA (%)	MT (%)				Micro (%)	Dila (%)	SNT (%)	D-E (%)	F (%)	GM (%)	TD (%)	Macro (%)
			CL/P	CL	CLA	CLP								
Present study (TCC)	280	89.6	60.4	42.9	41.3	67.0	25.0	6.4	6.1	0.4	0.4	0.4	-	
Wong et al (2012) ⁽¹⁴⁾	231	87.9	57.6	37.5	-	61.5	32.1	-	10.0	1.3	0.4	8.7	-	
Ackam et al (2010) ⁽⁵⁾	118	96.7	26.7	-	-	-	-	0.8	1.4	-	-	-	-	
Aizenbud et al (2005) ⁽⁶⁾	179	-	67.6	15.4	41.4	60.0	27.8	-	-	-	-	-	-	
Aizenbud et al (2011) ⁽²⁵⁾	17	-	-	17.6	-	-	-	-	29.5	5.9	11.8	-	11.8	
Lopes et al (1991) ⁽¹⁷⁾	86	-	23	-	25.0	30.0	18.0	-	20	-	-	-	-	
Schroeder & Green (1975) ⁽⁸⁾	56	-	40.4	-	-	-	-	-	7.0	-	-	-	-	
Al Jamal et al (2010) ⁽²²⁾	78	-	66.7	-	-	-	-	19.2	16.7	-	-	70.5	-	
Tereza et al (2010) ⁽²⁶⁾	205	-	70.2	-	-	-	-	-	11.7	-	-	-	-	

DA = dental anomaly, D-E = dens-evaginatus, Dila = dilaceration, F = fusion, GM = gemination, MT = Missing teeth, Micro = microdontia, Macro = macrodontia, SNT = supernumerary teeth, TD = taurodontism, N = total oral cleft subjects in each studies

roots, supernumerary teeth, and taurodontism⁽¹⁵⁾. The prevalence of DAs has been found to vary among different ethnic groups and cleft phenotypes^(15,16). In the present study, missing teeth, the most common DA, occurred among 60.4% of the total sample with distribution in CL/P groups similar to that of Wong et al⁽¹⁴⁾ (57.6%), shown in Table 11. The prevalence of missing teeth in this study increased strongly with the severity of cleft, being more prevalent in CLP than CL, CLA, and CP, as also reported by Wong et al⁽¹⁴⁾, Aizenbud et al⁽⁶⁾, and Lopes et al⁽¹⁷⁾. This confirmed other previous studies^(6,16,18,19) of higher occurrence of missing teeth in more severe cleft phenotypes.

Maxillary left lateral incisors were the most affected in the current study (38.9%), and in the ratio 2.2 of UCLA (20.5%) to UCLP (9.3%), similar to the Korean studies by Baek and Kim⁽²⁰⁾. They stated that the cleft phenotype perhaps affected tooth type and sidedness pattern of missing maxillary lateral incisors. Missing lateral incisors in BCLA/P were equal for left and right sides (Table 7). Maxillary missing teeth occurred more on the left side than the right side, in agreement with Shapira et al⁽¹⁶⁾. There is not enough knowledge to explain the left-sided predominance of clefts and missing teeth, which was obvious in the present study.

The present study confirmed previous studies that abnormalities in number, shape and size of permanent teeth are common in cleft populations, particular associated with cleft sites^(8,15,21). Prevalence of microdontia in the current study (41.4%) was similar to the result of Wong et al⁽¹⁴⁾ (42.4%) and Al Jamal et al.⁽²²⁾ (37%), Table 11. Microdontia in these oral cleft subjects was found only in the maxillary arch, both inside and outside the cleft. In addition, the most common microdontia site was the cleft-site lateral incisor. This study confirmed previous studies^(23,24) with more prevalence of microdontia in the cleft-site in BCLP over UCLP.

The percentage of oral cleft population in TCC affected with supernumerary teeth (6.1%) was similar to the Schroeder and Green⁽⁸⁾ (7.0%) but less than others^(14,17,22,25,26), referred to in Table 11. The prevalence of supernumerary teeth in BCLP was greater than in UCLP in the present study. On the other hand, Wong et al⁽¹⁴⁾ reported more frequency of supernumerary teeth in UCLP than BCLP subjects.

From Table 11, the prevalence of dilaceration in the current study (6.4%) was less than 19.2% of Al Jamal et al⁽²²⁾. Their report showed predominant dilaceration in BCLP (14.1%) over UCLP (5.1%) groups.

Table 12. Prevalence of dental anomalies comparing oral cleft subjects of the current study and a Thai non-cleft group⁽¹⁰⁾

Authors	N	≥ one DA	MT	Micro	SNT	F	G	Macro	D-E
Present study	280	89.6	60.4	41.4	6.1	0.4	0.4	-	-
Kositbowornchai et al. ⁽¹⁰⁾	570	38.6	26.1	13.7	2.6	0.7	-	1.4	-

N = total number of subjects, DA = dental anomaly, D-E = dens-evaginatus, F = fusion, G = gemination, Macro = macrodontia, Micro = microdontia, MT = missing teeth, SNT = supernumerary teeth

The present study agrees with Al Jamal et al⁽²²⁾, not only in there being more prevalence of dilaceration in BCLP (8%) than UCLP (0.05%) but also no gender differences in dilaceration. Dilaceration affected a Turkish CL/P population of Akcam et al⁽¹⁵⁾ (0.8%) much less than the CL/P population of the TCC.

The prevalence of dens-evaginatus in the present study was 0.4%, with one UCLP/R patient. The affected tooth was the cleft-site lateral incisor. From the Table 11, the CL/P subjects were affected with dens-evaginatus less than Wong et al⁽¹⁴⁾ (1.3%) and Aizenbud et al⁽²⁵⁾ (5.9%). The present study confirmed the previous studies^(14,15) of this rare DA which was frequently found in CLP subjects over the CL and CP groups.

The present study found taurodontism in one UCLP/R subject (0.4%), Table 11. The affected teeth were limited to the right and left maxillary first molars. Wong et al⁽¹⁴⁾ found 8.7% of taurodontism and mostly affected 65% of maxillary first molars. Al Jamal et al⁽²²⁾ revealed a surprisingly high prevalence of 70.5%, which might be attributable to different definition of DA's. Akcam et al⁽¹⁵⁾ reported taurodontism in one molar (1.9% of prevalence) in right and left sides only in UCLP/L group. Kuchler et al⁽²⁷⁾ suggested the possibility of taurodontism as a clinical marker of oral cleft. They also had higher impact on the left than the right sides, and it also presented in both arches of about half of affected subjects.

Fusion and gemination both had a prevalence of 0.4%. Tooth #11 was geminated in one BCLP subject. Wong et al⁽¹⁴⁾ reported the same prevalence of 0.4% with one BCLP subject having a gemination of #32. Aizenbud et al⁽²⁵⁾ reported two CL subjects with gemination of contralateral lateral incisors.

Dens-invaginatus and macrodontia was not detected in the TCC group. Akcam et al⁽¹⁵⁾ found dens-invaginatus in anterior teeth of UCLP groups: two right-sided teeth and four left-sided teeth with UCLP/R, and one left anterior tooth of their UCLP/L group. Macrodontia has rarely been found in oral cleft subjects and only one study reported such an anomaly, Table

11. Aizenbud et al⁽²⁵⁾ reported two CL subjects (11.8%) and all were cleft-site lateral incisors. They stated that isolated cleft lip is more likely to be associated with macrodontia, supernumerary teeth, and microdontia than other groups with osseous cleft. The mesenchymal tissues were hypothesized to be deficient in significant amount in more severe oral clefts, CP/L groups, thus contributing to absence of teeth.

The present study revealed no significant difference between gender and distribution of DAs, and is in agreement with previous studies^(15,19). On the contrary, Kuchler et al⁽²⁷⁾ found missing teeth was more frequent in females than males of the CL group but the CLP group exhibited more frequency in males than females. Walker and colleagues⁽²⁴⁾ measured tooth size of permanent teeth in UCPL, BCLP, CP and control groups, all of which had larger tooth size in males than females statistically significant but clinically insignificant.

Comparison of the occurrence of DAs in our oral cleft group with that of a group of Thai non-cleft subjects reported by Kositbowornchai et al⁽¹⁰⁾ showed that the percentage of subjects with at least one DA in the CL/P population was 2.3 times of the Thai non-cleft subjects (Table 12). The patterns of occurrence of several DAs of patients with clefts appear to be similar to those found among their non-cleft neighbors, such as highest for congenitally missing teeth, then microdontia and supernumerary teeth. Dens-evaginatus was not found in the oral cleft or non-cleft subjects.

Conclusion

The permanent teeth of the oral cleft population at TCC were affected with various types of DA: missing teeth, microdontia, dilaceration, supernumerary teeth, dens-evaginatus, fusion, gemination, and taurodontism. Subjects with isolated CP and CL were less likely to have as many types and frequencies of DA as those who had complete unilateral and bilateral CLP and CLA. Missing teeth was the most prevalent DA among oral cleft groups. Left alveolar

cleft-site was associated with more abnormalities of tooth number, microdontia, and dilaceration. Dens-evaginatus, fusion, gemination, and taurodontism were rarely found and limited to CLP subjects. There was no gender dimorphism for missing teeth, microdontia, dilaceration, and supernumerary teeth. The multidisciplinary approach to the oral cleft team should take the results into consideration in dental and orthodontic treatment planning.

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Potential conflicts of interest

None.

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ความชุกและชนิดของวิกลสภาพเหง้าฟันในกลุ่มผู้ป่วยไทยปากแหว่งเพดานโหว่ที่ไม่มีกลุ่มอาการโรค

ทัศนีย์ วังศรีมงคล, มนเทียร มโนสุตประสิทธิ์, พูนศักดิ์ ภิเศก, นิสา จิตติวัฒน์พงศ์

วัตถุประสงค์: เพื่อหาความชุกและชนิดของวิกลสภาพเหง้าฟัน ได้แก่ สภาพฟันน้อยเกิน เดนส์ อีแนวจินต์ส เดนส์ อินแวจินต์ส ความผิดปกติของรูปร่างรากฟัน การรวมตัวของฟัน การแตกหน่อของฟัน สภาพฟันใหญ่ สภาพฟันเล็ก สภาพฟันมากเกินไป ภาวะโพรงในตัวของฟันยึดขยายสู่ปลายรากในฟันแท้ของผู้ป่วยปากแหว่งเพดานโหว่ที่ไม่มีกลุ่มอาการโรค

วัสดุและวิธีการ: การศึกษาแบบภาคตัดขวางได้บันทึกข้อมูลวิกลสภาพเหง้าฟันจากข้อมูลต่างๆ ได้แก่ ภาพรังสีทอมอกราฟีรูปถ่ายในช่องปากแบบพิมพ์ฟัน และแบบบันทึกการรักษาทางทันตกรรมจัดฟันของผู้ป่วยปากแหว่งเพดานโหว่ชาวไทย ตะวันออกเฉียงเหนือจำนวน 280 คน อายุเฉลี่ยคือ 10.3 ± 3.2 ปี สถิติไคสแควร์ใช้เปรียบเทียบความชุกของวิกลสภาพเหง้าฟันระหว่างกลุ่มปากแหว่งเพดานโหว่รวมถึงระหว่างเพศชายและเพศหญิง

ผลการศึกษา: พบว่าผู้ป่วย ร้อยละ 89.6 ของกลุ่มตัวอย่างนี้มีวิกลสภาพเหง้าฟันอย่างน้อยหนึ่งชนิด ความชุกวิกลสภาพเหง้าฟันเรียงลำดับมากที่สุดไปน้อยที่สุดได้แก่ สภาพฟันน้อยเกิน (ร้อยละ 60.4) สภาพฟันเล็ก (ร้อยละ 41.4) ความผิดปกติของรูปร่างรากฟัน (ร้อยละ 6.4) สภาพฟันมากเกินไป (ร้อยละ 6.1) และพบความชุกร้อยละ 0.4 ในเดนส์ อีแนวจินต์สการรวมตัวของฟัน การแตกหน่อของฟันและภาวะโพรงในตัวของฟันยึดขยายสู่ปลายราก กลุ่มผู้ป่วยปากแหว่งเพดานโหว่ทั้งสองข้างมีความชุกของสภาพฟันน้อยเกิน (ร้อยละ 70.7) มากที่สุดเมื่อเทียบกับทุกกลุ่ม

สรุป: สภาพฟันน้อยเกินและสภาพฟันเล็กมีความชุกสูงสุดในกลุ่มตัวอย่างนี้ และความชุกแปรผันตามความรุนแรงของภาวะปากแหว่งเพดานโหว่ โดยพบความวิกลสภาพเหง้าฟันทั้งสองชนิดนี้มากที่สุดในฟันตัดด้านข้าง ไม่พบความแตกต่างของสภาพฟันน้อยเกิน สภาพฟันเล็ก สภาพฟันมากเกินไป และความผิดปกติของรูปร่างรากฟันระหว่างเพศชายและเพศหญิง
