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ORIGINAL ARTICLE

DENTAL ANOMALIES AND FACIAL PROFILE ABNORMALITY OF THE NON-SYNDROMIC CLEFT LIP AND PALATE CHILDREN IN KELANTAN

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This study was done to determine the prevalence of dental anomalies and facial profile abnormality and its association with the non-syndromic cleft lip and palate (CLP) as compared to the non-cleft children. A comparative cross sectional study was conducted where the case group consist of 98 non-syndromic CLP children-unilateral (UCLP) and bilateral (BCLP) who attended the Combined Clinic at Kota Bharu Dental Clinic (KBDC) while the comparison group comprised of 109 non-cleft children who attended the outpatient clinic at KBDC. Their ages were between 3 to 12 years old. Clinical oral and facial profile examinations were carried out to look for dental anomalies (morphology, number and alignment of teeth) and facial profile abnormality. The prevalence of anomalies in morphology of teeth in CLP (24.5%) and non-cleft (10.1%), number of teeth in CLP (44.9%) and non-cleft (7.3%), mal-alignment in CLP (79.6%) and non-cleft (27.5%) and facial profile abnormality in CLP (26.5%) and non-cleft (9.1 %). There was a significant association between CLP and anomalies in morphology, number, mal-alignment and abnormality in facial profile; ($p < 0.05$). Therefore, there was a high prevalence and risk of dental anomalies and facial profile abnormality in the CLP children compared to the non-cleft children.

***Key words** : cleft lip and palate, dental anomalies, hypodontia, supernumerary, facial profile*

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Introduction

Cleft lip and palate (CLP) has become a major public health problem affecting one in every 500 – 1000 births worldwide (1). It is the fourth most common birth defect and the most common congenital defect of the face (2). These patients are likely to have significant dental problems that require attention of various specialties in dentistry. Embryologically, the formation of tooth germs and the occurrence of cleft lip (CL) and/or cleft palate (CP) defects have a close relationship both in terms of timing and anatomical position. The odontogenic epithelium over the premaxillary and mandibular processes can be identified as early as the fifth embryonic week, while CL and/or CP anomalies are believed to occur during the fourth and seventh week period. By the 38th day, fusion of the frontonasal, maxillary and mandibular process is complete and specific odontogenic growth centres for primary central incisors and their permanent successors become evident (3). Various phenomena, including delayed tooth development, morphological anomalies in both sets of dentition, delayed eruption of permanent maxillary incisors, reduced tooth dimension and variations in tooth number, have been reported in cleft populations. Jordan *et al.* (1966) have described supernumerary teeth, congenitally missing teeth, T-cingulum and peg-shaped teeth and thick curved hypoplastic incisors in CLP children (4).

Anomalies in the number of teeth (hypodontia or supernumerary) outside the cleft area are more common in permanent dentition than in the primary dentition (3). Hypodontia is believed to be a consequence of: 1- physical obstruction or discruption of the dental lamina, 2- space limitation, 3- functional abnormalities of the dental epithelium

Table 1 Socio-demographic characteristics of study samples

Characteristic	UCLP (n= 78)		BCLP (n= 20)		Non- cleft (n= 109)	
	Mean (SD)	Freq (%)	Mean (SD)	Freq (%)	Mean(SD)	Freq (%)
Age	5.8 (2.61)	-	7.3 (3.06)	-	7.5 (2.60)	-
Gender						
Male	-	44 (56.4)	-	10 (50.0)	-	56 (51.4)
Female	-	34 (43.6)	-	10 (50.0)	-	53 (48.6)
Race						
Malay	-	75 (96.2)	-	18 (90.0)	-	108 (99.1)
Chinese	-	3 (3.8)	-	1 (5.0)	-	1 (0.9)
Indian	-	-	-	-	-	-
Others	-	-	-	1 (5.0)	-	-

and 4- failure of initiation of the underlying mesenchyme (5). The supernumerary teeth can erupt at birth as the natal teeth. In the Caucasian population, the prevalence of supernumerary teeth is about 1 to 3% (6,7). However, Buenviaje and Rapp (8) in their study among the Caucasian population found the prevalence of supernumerary teeth to be about 0.46%. A study done in Hong Kong by Davis (9) found that the number of Chinese children with supernumerary tooth was higher (2.7%) than that found in Caucasian children. Tay *et al.* (6) stated that there was a racial variation in the prevalence of supernumeraries with a frequency higher than 3% in the Mongoloid.

Table 2. Distribution of dental anomalies and facial profile abnormality in CLP (UCLP and BCLP) and non- cleft children

Variables	UCLP (n= 78)		BCLP (n=20)		Non-Cleft (n= 109)	
	Freq	%	Freq	%	Freq	%
Dental						
a. Morphology						
normal	62	79.5	12	60.0	98	89.9
abnormal	16	20.5	8	40.0	11	10.1
b. Number						
normal	45	57.7	9	45.0	101	92.7
hypodontia	29	37.2	11	55.0	6	5.5
supernumerary	4	5.1	0	0	2	1.8
c. Alignment						
normal	19	24.4	1	5.0	79	72.5
mal-alignment	59	75.6	19	95.0	30	27.5
Facial profile						
class I	61	78.2	11	55.0	99	90.8
class II	1	1.3	0	0	8	7.3
class III	16	20.5	9	45.0	2	1.8

Table 3. Prevalence of dental anomalies and facial profile abnormality in cleft and non-cleft children.

Variables	CLP (n= 98)		NON-CLEFT (n= 109)	
	%	95% CI	%	95% CI
Dental				
Morphology	24.5	15.82, 33.16	10.1	4.35, 15.84
Number	44.9	34.87, 54.92	7.3	2.37, 12.31
Alignment	79.6	71.47, 87.71	27.5	19.00, 36.04
Facial profile	26.5	17.63, 35.43	9.1	3.67, 14.68

Numerous investigations showed that the facial morphology in infants, children, adolescent and adults with CLP deviate from the norm (10). The upper or maxillary arch may not fit well with the mandibular arch; a misfit usually refered to as malocclusion. This malocclusion may be related to problems in maxillary arch width, or it may happen as a result of mid-facial growth deficiency. Many children and adults in general population as well as in the cleft population have malocclusion. Malocclusion may occur as a result of discontinuity of the maxillary arch, as when there is a cleft, or it may be due to congenital deformity affecting the subsequent growth. Cross bite in the cleft area is also very common due to the altered anatomy of the palate. The maxilla in unilateral cleft consists of two segments, a lesser segment on the cleft side (cleft segment) and a greater segment on the non-cleft side (non-cleft segment). The greater and lesser segment is not joined at the site of the cleft and as a result they can be displaced by lip pressure; thus it is common to find Cross bite on the affected side. In bilateral cleft, there are three maxillary segments, one premaxillary segment and two lateral segments. The lateral segments may be displaced medially, which frequently results in bilateral Cross bite. The premaxillary segment may be protrusive. Hayashi *et al.* (11) found that in CLP patients, the maxilla was smaller and located in a more posterior and upward position, upper facial height was less compared to the lower face and both upper and lower central incisors showed a marked lingual inclination.

Therefore, a child with cleft or other orofacial anomalies has a special need for early dental

Table 4 : Univariate analysis for association between CLP and dental anomalies and facial profile abnormality

Variable	Cleft Freq (%)	Non- cleft Freq (%)	Crude OR: OR	Crude OR: 95% CI	LR statistic	p- value
Dental						
a. Morphology						
Normal	74 (75.5)	98 (89.9)				
Abnormal	24 (24.5)	11(10.1)	2.9	1.33, 6.27	7.20	0.006
b. Number						
Normal	54 (55.1)	101 (92.7)				
Abnormal	44 (44.9)	8 (7.3)	10.3	4.52, 23.42	30.84	<0.001
c. Alignment						
Normal	20 (20.4)	79 (72.5)				
Abnormal	78 (79.6)	30 (27.5)	10.3	5.38, 19.60	49.86	<0.001
Facial Profile						
Normal	72 (73.5)	99 (90.8)				
Abnormal	26 (26.5)	10 (9.2)	3.58	1.62, 7.88	10.00	0.001

Table 5. Association between CLP and anomalies in morphology of teeth (outcome variable) adjusted for race, gender and age by using Multiple Logistic Regression[a]

Variable	Adjusted OR (95% CI)	LR statistic (df)	p-value
CLP	**3.80 (1.68, 8.61)**	**11.15 (1)**	**0.001**
Non-cleft	**1.00**		
Race[b]			
Malay	5.80 (0.00, -)	2.98 (1)	0.999
Others	1.00		
Gender[b]			
Female	0.65 (0.30, 1.41)	1.23 (1)	0.271
male	1.00		
Age [b]	1.15 (1.00, 1.32)	4.05 (1)	0.044

[a] the multiple logistic regression model is reasonably fit (Hosmer-Lemeshow goodness-of-fit: Chi square= 1.57, df= 8, p-value= 0.992; correctly classified= 83.1%, sensitivity= 2.9%, specificity= 99.4%; area under ROC curve= 0.706).

[b] controlled variables: these variables included in the model to control their confounding effect.

[b] there is no significant interaction between CLP and each controlled variable.

monitoring. In early childhood, the intra-arch relationship among the primary teeth and the inter-dental arches are important for the development of secondary dentition, which are required for orthodontic treatment. Good oral hygiene is mandatory in children with clefts. Intensive dental care is important in the mixed dentition stage and therefore every young child with cleft should be referred for specialist dental care.

Materials and Methods

A comparative cross-sectional study was carried out where the sources for cases were all the registered CLP children who attended the Combined Clinic at Kota Bharu Dental Clinic (KBDC) while the children the non-cleft group was the non-cleft children attending out patient clinic at KBDC that a six-month duration. The sampling frames were determined based on the following inclusion and exclusion criteria. The inclusion criteria for cases were operated non-syndromic CLP children. Patients in both cases and the comparison group were Kelantanese, aged between 3 and 12 years. This age ranged was selected because all the deciduous teeth would have erupted by the age of 3 years and by the age of 12 years, majority of the permanent teeth would be present. Therefore, a total of 98 CLP and 107 non-cleft children were selected using the systematic random sampling. A single examiner at the dental clinic carried out clinical examination with the child seated on a proper dental chair under good lighting and using a mouth mirror. Dental anomalies in terms of morphology, number of teeth and alignment were taken into consideration. Facial profile was classified according to class I, II or III relationship. The soft tissue facial profile was visually estimated for each patient. The profile was classified according to the method described by Turner *et al.* (12). Superficial facial features were viewed from the patient's right side while the patient was seatted in a comfortable upright position. The patient was positioned to look straight ahead and to have the Frankfurt horizontal plane parallel to the floor. According to Turner *et al.* (12), a convex profile indicates a skeletal class II jaw relationship, whereas a concave profile indicates a skeletal class III relationship but does not indicate which jaw is at fault. Convexity and concavity of the facial profile was established by viewing the relationship between the two lines, one line is dropped from the bridge of the nose to the base of the upper lip and the second extending from the base of the upper lip to the chin. If these line segments formed a straight line, a class I classification was recorded. An angle between the lines indicating either profile convexity (upper jaw prominent relative to chin) was a class II classification, and profile concavity (upper jaw

Table 6 : Association between CLP and anomalies in number of teeth (outcome variable) adjusted for race, gender and age by using Multiple Logistic Regression[a]

Variable	Adjusted OR (95% CI)	LR statistic (df)	p-value
CLP	**15.26 (6.18, 37.65)**	**49.13 (1)**	**< 0.001**
Non-cleft	**1.00**		
Race[b]			
Malay	3.35(0.35, 32.30)	1.30 (1)	0.296
Others	1.00		
Gender[b]			
Female	1.11 (0.54, 2.29)	0.08 (1)	0.777
male	1.00		
Age [b]	1.20 (1.04, 1.37)	7.04 (1)	0.010

[a] the multiple logistic regression is reasonably fit (Hosmer-Lemeshow goodness-of-fit: Chi square= 3.34, df= 8, p-value= 0.851; correctly classified= 78.7%, sensitivity= 30.8 %, specificity= 94.8 %; area under ROC curve= 0.796).

[b] controlled variables: these variables included in the model to control their confounding effect.

[b] there is no significant interaction between CLP and each controlled variable.

behind chin) was a class III classification.

SPSS version 11.0 (SPSS Inc., 1999) statistical software was used for data entry and data analysis. Descriptive statistics such as mean and standard deviation (SD) or median and interquartile range (IQR) for continuous variables, and frequency and percentages for categorical variables were calculated for each group. Simple logistic regression followed by multiple logistic regression analysis was used to determine the association between the study factor (CLP versus non-cleft) and each categorical outcome (anomalies and abnormality), crude and adjusted odds ratios (adjusted for race, gender and age) were obtained from simple and multiple logistic regression respectively. 95% Confidence Interval (CI) of the odds ratios and p-value of likelihood-ratio (LR) tests were obtained in order to make inferences to the study population.

Results

Socio-demographic profile of cleft lip and palate children (CLP) in Kelantan

A total of 98 CLP (unilateral or bilateral) and 109 non-cleft children (comparison group) agreed to participate in the study. Table 1 shows the socio-demographic characteristics of the 207 subjects. In the CLP group, 78 (79.6%) were unilateral cleft lip and palate (UCLP) and 20 (20.4%) were bilateral cleft lip and palate (BCLP). The mean age for UCLP, BCLP and non-cleft was 5.8 (SD 2.61), 7.3 (SD 3.06) and 7.5 (SD 2.60) years respectively. Males outnumbered females in the UCLP and the non-cleft group; 56.4% and 51.4% respectively. However they were equal in number in the BCLP group. Malays were in the majority in all groups of UCLP (96.2%), BCLP (90.0%) and the non-cleft (99.1%).

Table 2 shows the comparison of the distribution of dental anomalies and facial profile abnormality in the CLP and the non-cleft children. Morphological anomalies of teeth were observed in 40.0% of the BCLP whereas only 20.5% in the UCLP and 10.1% in the non-cleft children. Hypodontia was observed in 37.2% in the UCLP children compared to 55.0% in the BCLP and only 5.5 % in the non-cleft children. Supernumerary teeth occurred more frequently in the UCLP (5.1%) compared to the BCLP (0%) and the non-cleft (1.8%) patients. 95.0% of the BCLP patients had mal-alignment of the teeth compared to 75.6% in the UCLP and 27.5% in the non-cleft children. In the CLP group, only 78.2% of the UCLP and 55.0% of the BCLP children were in class I facial profile compared to the non-cleft children (90.8%). Class

Table 7 : Association between CLP and mal-alignment (outcome variable) adjusted for race, gender and age by using Multiple Logistic Regression[a]

Variable	Adjusted OR (95% CI)	LR statistic (df)	p-value
CLP	**23.67 (9.93, 56.40)**	**76.32 (1)**	**<0.001**
Non-cleft	**1.00**		
Race[b]			
Malay	0.85(0.08, 8.90)	0.02 (2)	0.889
Others	1.00		
Gender[b]			
Female	1.36 (0.68, 2.70)	0.77 (1)	0.382
male	1.00		
Age [b]	1.40 (1.20,1.63)	22.27 (1)	<0.001

[a] the multiple logistic regression model is reasonably fit (Hosmer-Lemeshow goodness-of-fit: Chi square= 6.81, df= 8, p-value= 0.557; correctly classified= 74.4%, sensitivity= 76.9 %, specificity= 71.7%; area under ROC curve= 0.166).

[b] controlled variables: these variables included in the model to control their confounding effect.

[b] there is no significant interaction between CLP and each controlled variable.

III facial profile occurred mostly in the CLP children (45% in the BCLP and 20.5% in the UCLP) but only 1.8% in the non-cleft children. The percentage of children with Class II profile is very low (1.3%, 0% and 7.3% in the UCLP, BCLP and non-cleft respectively).

Prevalence of dental anomalies and facial profile abnormality in CLP and non-cleft children

Table 3 shows the comparison of the prevalence of dental anomalies and facial profile abnormality at 95% Confidence Interval (CI) between the CLP and non-cleft children. For anomalies in number, supernumerary and hypodontia were grouped together and for facial profile abnormality, class II and class III were grouped together. CLP children were shown to have higher prevalence of dental anomalies and facial profile abnormality compared to the non-cleft children.

Association between CLP and dental anomalies and facial profile abnormality

Table 4 shows the summary of results of simple logistic regression (SLR) analysis (univariate analysis) of the association between the CLP and dental anomalies and facial profile abnormality. In the analysis, the UCLP and BCLP children were combined into one group (CLP group) to the compare to non-cleft group. There was a significant association between CLP and dental anomalies (morphology, number and alignment) as well as facial profile abnormality.

Tables 5 to 8 show the summary of result of multiple logistic regression analysis (multivariate analysis) of the association between CLP and dental anomalies and facial profile abnormality. As shown in Table 5, CLP was significantly associated with morphological anomalies of the teeth. The two-way interactions were not significant. Hosmer-Lemeshow test for fitness of model was not significant (p-value= 0.992 at df= 8). Therefore, the model was fit. In this model, sensitivity was 2.9% and specificity was 99.4%. The area under the Receiver Operating Characteristic (ROC) curve was 0.706. Table 6-8 show that CLP and age (controlled variable) were significantly associated with anomalies in the number of teeth, mal-alignment and facial profile abnormality. However the two-way interactions were not significant. Hosmer-Lemeshow test for fitness of model was not significant. Therefore, the entire model was fit.

Table 8 : Association between CLP and facial profile abnormality (outcome variable) adjusted for race, gender and age using Multiple Logistic Regression[a]

Variable	Adjusted OR (95% CI)	LR statistic (df)	p-value
CLP	**5.10 (2.17, 12.00)**	**15.92 (1)**	**<0.001**
Non-cleft	**1.00**		
Race[b]			
Malay	1.34 (0.14, 13.21)	0.06 (1)	0.800
Others	1.00		
Gender[b]			
Female	1.18 (0.55, 2.54)	0.18 (1)	0.670
male	1.00		
Age [b]	1.23 (1.07,1.41)	9.07(1)	0.003

[a] the multiple logistic regression model is reasonably fit (Hosmer-Lemeshow goodness-of-fit: Chi square= 6.69, df= 8, p-value= 0.384; correctly classified= 82.6%, sensitivity= 13.9 %, specificity= 97.1%; area under ROC curve= 0.718).

[b] controlled variables: these variable included in the model to control their confounding effect.

[b] there is no significant interaction between CLP and each controlled variable.

Discussion

Out of 98 CLP children who participated in this study, most of them were UCLP (79.6%). UCLP were more common in male (56.4%) than in female. A study done by Vanderas (13) among the Caucasian population showed that unilateral cleft lip (UCL) with or without cleft palate (CP) was twice as frequent in males as compared to females. Taher (14) in his study in Tehran found that 60.9% of the CLP patients were male. Although the results of this study are similar to those of Vanderas (13) and Taher (14), the variables in this study were not matched for gender. Interestingly, the socio-demographic profile of CLP children in these three studies showed a preponderance for male. Our study therefore, further strengthens the view that CLP pathology has a sex predilection.

In children with CLP, dental development is affected more frequently than in non-cleft children. The lateral incisor in the region of the alveolar cleft is very sensitive to developmental disorders. The teeth outside the cleft area are also more frequently affected compared to the non-cleft children.

The prevalence of anomalies in morphology of teeth was higher (24.5%) in CLP children compared to the non-cleft children (10.1%). Among the CLP children, an anomaly in dental morphology was detected more in the BCLP (40.0%) compared to the UCLP (20.5%) children. The risk of having morphological anomalies of teeth in CLP children was 3.8 times more than the non-cleft children. However, our results only showed the frequency but did not show the severity of these anomalies in CLP children. The most common morphological anomaly was a peg-shaped upper lateral incisor. The prevalence of peg-shaped lateral incisor in the non-cleft children in this study was much higher than thats in the Nigerian non-cleft children which, was 1.5% (15) and Caucasian children 0.34 % (8).

Variation in tooth morphology is still not well understood from the genetic point of view. It seems likely that many of these traits are not due to single gene substitutions. Many previous studies tried to associate between missing teeth and 'peg-shaped laterals' where they suggested that a continuum of effects from reduced size through absence might be explained on the basis of individual differences in dental development at the time the 'missing tooth genes' exerted their influence (16). If the genes act at a comparatively early stage, total suppression of the anlage may result, whereas if development is further advanced before the genetic mechanism comes into play, the anlage may be only partially suppressed and result in a small tooth (16). Since dental anomalies in our population is higher than in Caucasian population, we could suggest that genetic cleft mechanism in our population starts earlier in the embryological life. Therefore, it is more difficult to prevent the cleft formation because the cleft mechanism starts very early before the mother even knows that she is pregnant.

In this study the prevalence of anomalies related to the number of teeth was higher in the CLP children (44.9%) compared to the non-cleft children (7.3%). Among the CLP children, the percentage was higher in the BCLP (55.0%) than the UCLP (42.3%). The percentage of hypodontia (congenital absence of the teeth) was found to be more in the BCLP (55.0%) compared to the UCLP (37.2%) and the non-cleft group (5.5%). The results showed that the risk of having anomalies in number was 15.3 times more in the CLP children compared to the non-cleft children. Our findings are supported by the study done by Tsai *et al.* (3) who found that the prevalence of hypodontia among the UCLP group was 60.6% which was higher compared to the non-cleft children. In the BCLP children, our findings were also supported by Holtgrave (17); where it was found that the occurrence of hypodontia increased with the severity of the cleft and therefore, more prevalent in children with BCLP. Mccance *et al.* (18) and Holtgrave (17) in their study also concluded that in children with CLP, hypodontia in the primary dentition occurs most frequently in the cleft region, particularly affecting the lateral incisors. In our CLP children, we also found that the increase in severity of the cleft is associated with higher number of missing teeth. Therefore, we suggest that the more severe cleft mechanism starts even earlier in intrauterine life compared to the less severe cleft.

These anomalies are also present in the non-cleft population, but to a lesser extent. Holtgrave, (17) reviewed a study done by Jordan *et al.* (1966) who pointed out that the same factors which are responsible for the cleft population also affect the dentition of the non-cleft population. The prevalence of hypodontia and supernumerary teeth among non-cleft children was found to be 5.5%. Table 9 shows the comparison of the prevalence of hypodontia and supernumerary in normal children with those of other studies (8). The table shows that the percentage of hypodontia ranged between 2.7% and 6.0%. A study by Sawyer *et al.* (19) showed that the prevalence of missing lateral incisor in normal children in Nigeria was only 0.7%. Lekkas *et al.* (20) found that the prevalence of congenital absence of permanent teeth in the non-cleft population is lower than 6%. Therefore our prevalence for hypodontia correlates with other studies.

In our study, the prevalence of supernumerary was only found in the UCLP but none in the children with BCLP. However, an earlier study found that the supernumerary teeth were indeed present in the BCLP (21). They also found that in children with UCLP and unilateral cleft of the alveolus (UCLA), the presence of supernumerary teeth was more prevalent in the primary dentition than in the permanent dentition. They noted a similar finding in children with BCLP and bilateral cleft of the alveolus (BCLA). Inouye (1915) suggested that the separation of epithelium may cause a supernumerary root to develop; a partial lack of epithelium makes the intermediate type, and a significant lack of epithelium makes the tooth not to develop (21). Therefore, in this study it is postulated that the gene responsible for CLP leading to abnormal number of teeth (such as supernumerary) only express itself during the intrauterine life and is shut off thereafter.

The prevalence of supernumerary teeth varies between 0.1% and 3.6% in the non-cleft population (22), which correlates with our findings (1.8%). However, the prevalence of supernumerary tooth in our study was less compared to the Chinese (9) but more compared to Caucasian populations (8).

Our study correlates with the findings of previous studies, which reported that in the CLP

Table 9 : Comparison of hypodontia and supernumerary with other studies in non-cleft population

Type of anomalies	Byrd (1943) (%)	Clayston (1956) (%)	Luten (1967) (%)	McKibben (1971) (%)	Buenviaje & Rapp (1984) (%)	Our study (%) (2003)
Congenitally missing teeth	2.7	6.0		5.4	3.7	5.5
Supernumarary teeth and mesiodens	0.52	1.9	2	1.5	0.46	1.8

* Buenviaje and Rapp - 1984

children, congenital absence of teeth was the most frequent anomaly followed by anomalies in tooth morphology (8, 17, 23,). It also showed that children with BCLP have more dental anomalies than those with UCLP (17).

The prevalence of mal-alignment in this study was higher in the CLP children (79.6%) compared to the non-cleft children (27.5%). Among the CLP children, mal-alignment was detected more in the BCLP children (95.0%) compared to the UCLP (75.6%). The results showed that the risk of having mal-alignment teeth in CLP children was 23.7 times more compared to the non-cleft children. Mal-alignment due to mal-development of the arch, dental morphology and number anomalies, mal-position and transposition of the teeth are fairly common in children with CLP. McCance *et all.* (18) in their study found that repaired CLP will have transverse narrowing dental arch and a high prevalence of cross bites and class III malocclusion. Our findings supported the statement by Ranta (24) that the surgery of the lip and palate will result in the maxillary growth disturbances in the region of cleft. In the region outside cleft, Ranta (24) found that transposition of tooth germ is not due to the surgical intervention but may be a growth disturbance during the formation of the tooth bud, and/ or the surrounding tissues. Therefore, growth disturbances of the maxilla during the initiation stage or later in the course of tooth formation may partly explain the tooth transposition. In the maxillary arch, the relationship of the cleft segment varies from normal to various degrees of medial collapse, particularly in the canine area, causing an increased incidence of cross bite. On the non-cleft side, the premaxillary segment has a tendency to rotate forward (25). This condition will increase the severity of mal-alignment in the CLP patients.

It is more difficult for CLP children to achieve optimal cleaning in the mal-alignment teeth and also in the cleft region because of the anatomy of the cleft area, residual scar tissue and immobility of the lip. A significantly higher risk for dental anomalies among the CLP children was found in this study; therefore a review on oral health status in our combined clinic is very crucial for early dental monitoring. Transposition of the teeth should be taken into consideration in planning of the patient's overall dental care and orthodontic treatment.

Table 10 : Distribution of skeletal profilè in Shrophire children age 11-12 years

Skeletal profile	(%)
Skeletal class I	40.8
Skeletal class II	53.8
Skeletal class III	5.3

*Foster, 1982

In this study the prevalence of abnormal soft tissue facial profile was higher in the CLP children (26.5%) compared to non-cleft children (9.1%). Among the CLP children, abnormal facial profile was higher in the BCLP (45.0%) than the UCLP (21.8%). Among the UCLP, there were more children with class III facial profile (20.5%) compared to the class II (1.3%). The only facial profile abnormality in the BCLP was class III. The facial profile class II was higher in the non-cleft children compared to the CLP children. In this study, the risk of getting abnormal facial profile was found to be 5.1 times more in the CLP children compared to the non-cleft children. Very little is available in the literature concerning facial morphology of the operated CLP patients. Turner *et al.* (12) found that in the UCLP patients, 69% were class I, 11% class II and 20% were class III facial profile. Our study also found that the CLP children tend to have more Class III facial profile compared to class II facial profile. Some authors believe that maxillary hypoplasia is an intrinsic primary cause, while others propose that it is secondary to surgical repair (26). This is supported by studies done on operated CLP cases which agrees with the iatrogenic hypothesis (27). A number of investigators believe that untreated UCLP have the same growth potential as the non-cleft individuals and that the anomaly is limited to the immediate area of the cleft. They believe that the maxilla and the mandible achieve the same size and relationship as those in the non-cleft individuals. However, there is still confusion and controversy regarding the optimal timing of the palatal closure. Early surgical closure of the palate is advocated in order to facilitate normal speech development whereas delayed closure is claimed to improve maxillary growth (27).

In this study, the class II facial profile was more prevalent in the non-cleft children compared to the CLP children. Normal variation in the facial profile relationship exists in all populations. It was previously thought to be largely related to the environment where the total growth of the jaws being related to nutrition, masticatory function and the presence or absence of upper respiratory infection

(28). In his study on Shrophire children aged 11 to 12 years, Foster found the following distribution of relationship as shown in table 10 (28).

The results show that class II malocclusion is more common in Shrophire children compared to our children. Therefore from this result, it can be concluded that, in some populations at least, class II relationship is more 'normal' than the ideal class I relationship (28). This explained the high percentage of class II in the non-cleft groups than the CLP groups in this study.

Based on this study, a scientific database on oral and craniofacial anomalies can be provided for the country. The authors hope that a standard protocol for the management of this group of patients can be developed in Hospital Universiti Sains Malaysia (HUSM).

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