BJMS
Borneo Journal of Medical Sciences

ORIGINAL ARTICLE

Prevalence of Dental Anomalies in Cleft Lip and Palate Patients Referred for Orthodontic Treatment

Jin Han Lee*

Department of Orthodontics, Queen Elizabeth II Hospital, Sabah, Malaysia.

*Corresponding author's email: jinjinhlee@yahoo.com

Received: 6 August 2024

Accepted: 6 November 2024

Published : 2 May 2025

DOI: https://doi.org/10.51200/bjms.v19i2.5488

ABSTRACT

In Malaysia, cleft lip and palate (CLP) prevalence varies, and dental anomalies increase the patients' need for dental care and orthodontic treatment. This cross-sectional study aimed to assess the prevalence of dental anomalies in CLP patients referred for orthodontic treatment at a government clinic in Kota Kinabalu. Demographic data, patterns of CLP, and dental anomalies from 85 dental records in 2010-2021 were reviewed retrospectively and analysed descriptively. The gender and the dental anomalies differences were tested using Fisher's exact test. The mean age of the patients at the time of referral was 12.12 ± 0.48 years. There were 84 (98.82%) patients presented with at least one dental anomaly. More than one-third of the patients presented with more than one type of dental anomaly (45.88%). The most common dental anomalies were hypodontia (68.24%), peg-shaped lateral incisor (34.12%), impacted teeth (31.76%), supernumerary (11.76%), and transposition (9.41%). Almost all patients with hypodontia had missing lateral incisors (98.28%). 66.67% of patients with impacted teeth had impacted canine. In conclusion, almost all CLP patients referred for orthodontic treatment had at least one dental anomaly, with a prevalence of 98.82%. Multiple dental anomalies affected more than one-third of the patients. Hypodontia was the most common dental anomaly, with lateral incisors most prevalent. Other dental anomalies were

Keywords: *Dental anomalies, cleft lip palate, hypodontia, peg lateral, impacted, supernumerary*

peg-shaped lateral incisors, impacted teeth, mostly impacted canine, supernumerary, and transposition. Early identification of dental anomalies in CLP patients is very important in treatment planning to allow timely referral to the multidisciplinary team.

INTRODUCTION

In Malaysia, the prevalence of cleft lip and palate (CLP) was varying in different regions of the country; 0.76 (Noraihan et al., 2005), 1.24 (Boo & Arshad, 1990), and 1.69 (Thong et al., 2005) per 1000 live births. The Chinese had the highest prevalence (1.9 per 1000 deliveries), while the Malay had the lowest prevalence (0.98 per 1000 deliveries) (Boo & Arshad, 1990). Unilateral cleft palate was the most common (Boo & Arshad, 1990; Shah et al., 2015), with the left side being more affected (Chai et al., 2013; Shah et al., 2015). It was more prevalent in females compared to males (Shah et al., 2015). However, based on a pilot epidemiological study in Sabah, cleft lip with or without cleft palate, was more prevalent among the males (Chai et al., 2013).

CLP patients experience aesthetic, speech, hearing, dental, and psychological complications (Haque & Alam, 2015). The findings of dental anomalies were higher in CLP patients compared to the normal population (Ai Jamal et al., 2010; Lehtonen et al., 2015; Paradowska-Stolarz & Kawala, 2023; Wong et al., 2012). More than 90% of CLP patients have at least one dental anomaly (Akcam et al., 2010; Nicholls, 2016), while 34% have more than one dental anomaly (Nicholls, 2016). Common dental anomalies associated with CLP were hypodontia, supernumerary, morphological anomalies, delayed teeth development and eruption, and microdontia (Haque & Alam, 2015). The lateral incisor was the most affected tooth (Paradowska-Stolarz & Kawala, 2023).

The management of CLP patients started from birth till adulthood by a multidisciplinary team of paediatrics, plastic surgery, oral and maxillofacial surgery, otolaryngology, orthodontics, genetics, prosthodontics, psychology, social work, speech therapy, and nursing (Shetye, 2016). Knowledge of the prevalence of dental anomalies in CLP patients is important because the malocclusion is complicated due to the presence of multiple dental anomalies. Dental anomalies increase the patients' need for dental care (Namdar et al., 2021) and orthodontic treatment (Sander et al., 2022).

Therefore, this study aimed to assess the prevalence of dental anomalies in CLP patients referred for orthodontic treatment at a government clinic in Kota Kinabalu, specifically to evaluate the prevalence of hypodontia, impacted teeth, supernumerary teeth, and other dental anomalies in CLP patients. This clinic received referrals within Sabah state and from the Federal Territory of Labuan and Limbang, Sarawak.

MATERIALS AND METHODS

All dental records of written case notes, relevant radiographs, and study models that fulfilled the inclusion criteria were selected and assessed retrospectively. Ethical approval to conduct this study was acquired from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and registered with the National Medical Research Register (NMRR-20-1736-56007). The sample was the CLP patients referred for orthodontic treatment at a government clinic in Kota Kinabalu from 2010 to 2021.

The sample size was calculated using the prevalence formula (Naing et al., 2022). The inclusion criteria were patients who presented with cleft lip and/or cleft palate. The exclusion criteria were patients with other congenital craniofacial syndrome, and incomplete dental records to diagnose the dental anomalies. A total of 89 dental records of cleft lip and/ or

cleft palate patients were taken and assessed. However, all four cleft lip-only or cleft palate-only patients (one cleft lip-only patient and three cleft palate-only patients) were not included in the analysis as there was no dental anomaly among them, leaving 85 cleft lip and palate patients for data analysis.

Data included were demographic details (age, gender, and ethnic group), pattern of CLP, and types of dental anomalies. Only dental anomalies on the upper arch (maxilla) were taken. A standardised data collection form was used to record the data. All variables were analysed descriptively using Stata 15. Fisher's exact test was used to evaluate the differences between the proportions of the dental anomalies in males and females. The level of significance was 5% ($p < 0.05$).

RESULTS

The mean age of the CLP patients at the time of referral was 12.12 ± 0.48 years. More than half of the patients were males (n=47, 55.29%). Most of the patients were Bumiputera Sabah; Kadazan Dusun (n=29, 34.12%), Bumiputera Sabah lain (n=19, 22.35%) and Bajau (n=11, 12.94%), followed by Chinese (n=12, 14.12%), Malay (n=7, 8.23%), and other ethnic groups (Indian, Bisaya, Bumiputera Sarawak, Iban, and Kedayan) (n=7, 8.23%) (Table 1).

Table 1: Demographic profile of the patients (n=85)

Variables		n (%)	Mean ± SE
Age			12.12 ± 0.48
Gender	Male	47 (55.29)	
	Female	38 (44.71)	
Ethnic groups	Bumi-putera Sabah	59 (69.41)	
	Chinese	12 (14.12)	
	Malay	7 (8.23)	
	Others	7 (8.23)	

Nearly two-thirds of the patients had unilateral CLP (n=54, 63.53%). Left side unilateral CLP (n=35, 41.18%) almost doubled right side unilateral CLP (n=19, 22.35%). More than one-third of the patients had bilateral CLP (n=31, 36.47%) (Figure 1).

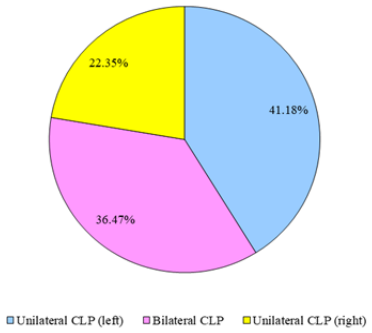

Figure 1: Pattern of CLP among the patients (n=85)

There were 84 (98.82%) CLP patients presented with at least one dental anomaly, while one (1.18%) CLP patient had no dental anomaly. More than half of the patients presented with one type of dental anomaly (n=45, 52.94%). More than one-third of the patients presented with two types of dental anomalies (n=30, 35.29%), while there was about one-tenth of the patients presented with more than two types of dental anomalies (n=9, 10.59%) (Figure 2).

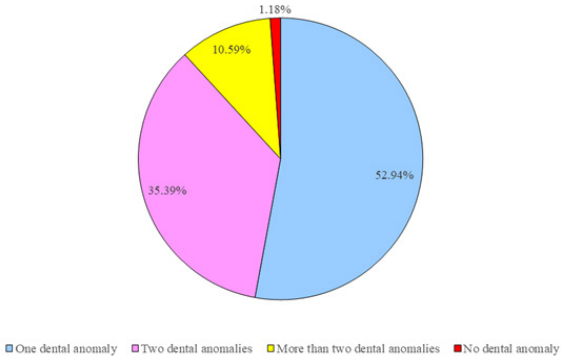

Figure 2: Frequency of dental anomalies among the patients (n=85)

The most common dental anomalies were hypodontia (n=58, 68.24%), peg-shaped lateral incisor (n=29, 34.12%), impacted teeth (n=27, 31.76%), supernumerary (n=10, 11.76%), and transposition (n=8, 9.41%) (Figure 3).

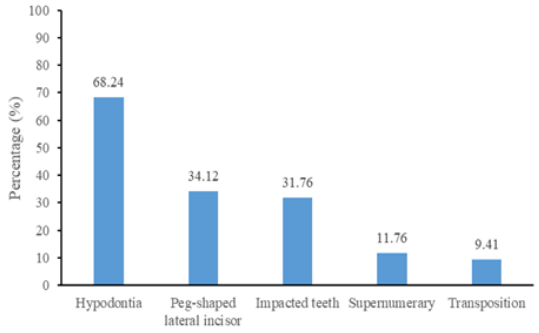

Figure 3: Prevalence and types of dental anomalies among the patients (n=85)

Almost all of the patients presented with hypodontia had missing lateral incisors (n=57, 98.28%). More than one-quarter had a missing second premolar (n=15, 25.86%), followed by a missing central incisor (n=3, 5.17%), missing first premolar (n=3, 5.17%), and missing canine (n=1, 1.72%) (Figure 4).

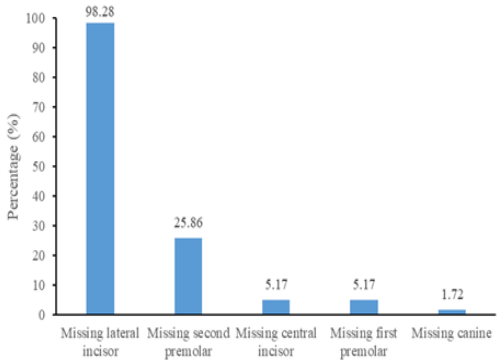

Figure 4: Prevalence and types of missing teeth among patients presented with hypodontia (n=58)

Meanwhile, two-thirds of the patients presented with impacted teeth had impacted canine (n=18, 66.67%), followed by impacted second premolar (n=8, 29.63%), impacted lateral incisor (n=7, 25.93%), and impacted first premolar (n=1, 3.70%) (Figure 5).

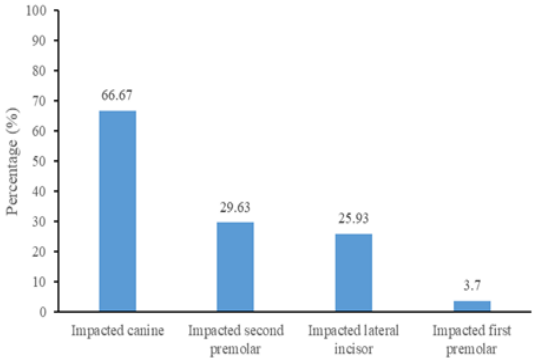

Figure 5: Prevalence and types of impacted teeth (n=27)

The prevalence of hypodontia in females was higher than in males. Meanwhile, the prevalence of impacted teeth, supernumerary, and transposition in males was higher than in females, with the prevalence of transposition in males more than twice compared to females. The prevalence of peg-shaped lateral incisors was about the same in males and females. There were no significant differences between males and females for each type of dental anomaly, $p > 0.05$ (Table 2).

Table 2: Prevalence and types of dental anomalies between the genders (n=85)

	Males, n (%)	Females, n (%)	p-value
Hypodontia	31 (65.96)	27 (71.05)	0.647
Peg-shaped lateral incisor	16 (34.04)	13 (34.21)	1.000
Impacted teeth	17 (36.17)	10 (26.32)	0.359
Supernumerary	6 (12.77)	4 (10.53)	1.000
Transposition	6 (12.77)	2 (5.26)	0.288

DISCUSSION

In Sabah, CLP were among the common congenital craniofacial anomalies referred for orthodontic consultation and treatment. In this study, CLP were more prevalent in males, supporting the finding of a previous study in Sabah (Chai et al., 2013). The majority of the CLP patients were Bumiputera Sabah ethnicity.

Some of the patients were from the Federal Territory of Labuan and Limbang, Sarawak because the government orthodontic clinic in Kota Kinabalu was more accessible to them during the period of the year 2010 to 2021.
The mean age of the patients referred for orthodontic consultation showed delayed referrals as the mean age of pre-alveolar bone graft orthodontic treatment was 8.72 ± 0.70 years (Chang et al., 2022). Early referrals are important for diagnosis and treatment planning as an alveolar bone graft is needed to assist timely eruption of the teeth at the cleft.
Unilateral CLP occurred more frequently than bilateral CLP, with the left side more affected (Jamilian et al., 2016; Namdar et al., 2021). This was because the embryonic fusion of the palate on the right side lasted longer and occurred later in development (Paradowska-Stolarz & Kawala, 2014).

The prevalence of dental anomalies in this study showed almost all CLP patients had at least one type of dental anomaly. For patients at CLP centres, the prevalence of dental anomalies was lower, 80.6% (Ezzeldin et al., 2023). This gave the impression that dental anomalies might be among the main reasons for orthodontic referrals for CLP patients. There were no significant gender differences in the prevalence of dental anomalies, which agrees with other studies (Al-Kharboush et al., 2015; Namdar et al. 2021; Ousehal et al., 2024). Dental anomalies occurred more frequently on the side of the cleft (Camporesi et al., 2010) and increased with the severity of the cleft (Lasota, 2021). Therefore, in patients with cleft lip only or cleft palate only, dental anomalies were relatively lower. The prevalence of hypodontia was 34.14%, while supernumerary was only 2.43% among complete cleft palate patients. Furthermore, the prevalence of hypodontia and supernumerary reduced among incomplete cleft palate patients (Schwartz et al., 2014).

In this study, patients with cleft lip only or cleft palate only were not included in the analysis as there was no dental anomaly among them. The arch of their maxilla was not affected, and dental anomalies were least apparent. A study found that surgical trauma due to primary periosteoplasty, decreased blood supply associated with palatal defects, and absence of early orthopaedic treatment significantly increased the prevalence of dental anomalies (Korolenkova et al., 2019). Patients with cleft lip only or cleft palate only might not require orthodontic treatment (Sharma et al., 2021).

Hypodontia was the most common dental anomaly in this study, with more than two-thirds prevalence, similar to a study in Saudi Arabia (Al-Kharboush et al., 2015; Pradhan et al., 2020). This was higher than a study in Hong Kong, that found half of the CLP children had hypodontia, 57.6% (Wong et al., 2012) but lower than a study in Nepal, 77.9% (Pradhan et al., 2020). Missing lateral incisor at the side of the cleft was highest, same as other studies (Chang et al., 2022; Germec Cakan et al., 2018; Jamilian et al., 2016; Muller et al., 2021; Pradhan et al., 2020). The theories behind frequently missing lateral incisors at the cleft site were mesenchyme deficiency, multiple genetic and environmental factors, and the direct effect of the cleft on the primordial tissues related to the development of the tooth (Ross & Johnston, 1972). The clinical implications of hypodontia were aesthetic and functional disturbances for the patients. Implant placement was often not possible, especially at the cleft site due to decreased bone (Lasota, 2021). Therefore, a bridge or removable denture might be more suitable for the patients to replace the missing teeth.

The prevalence of peg-shaped lateral incisors in this study was lower than in other studies, 45.6% (Al-Kharboush et al., 2015). The cause of the formation of peg-shaped lateral incisors might be associated with primary periosteoplasty surgery and decreased blood supply (Korolenkova et al., 2019). The clinical implications of the smaller size of the peg-

shaped teeth were tooth size to arch length discrepancy and dental asymmetry. Following orthodontic alignment, usually, restorative treatment to build up the teeth will be needed to improve the aesthetic appearance.

The prevalence of impacted teeth in this study was higher compared to a similar study, 12.5% (Al-Karboush et al., 2015). Teeth most often affected were the canine at the cleft. The causes for the impaction were the constricted maxilla, insufficient bone, and lack of space for eruption. Timely orthodontic expansion and alveolar bone graft could assist these teeth in erupting by providing bone volume and space. In this study, the prevalence of supernumerary was close to other studies (Al-Kharboush et al., 2015; Pradhan et al., 2020; Wong et al., 2012). During cleft formation, fragmentation of the dental lamina might form supernumerary (Watted et al., 2014). The clinical complications of supernumerary are interference to alveolar bone graft (Lasota, 2021) and often preventing eruption of adjacent teeth by obstructing the path of eruption.

Transposition was due to the displacement of tooth germs due to the constricted maxilla. In this study, transposition occurred often between the canine and first premolar. Management of transposition depends on the level of transposition. In true transposition, it is best to accept the transposed positions without intervention (Lasota, 2021) to prevent complicated and prolonged treatment and to avoid iatrogenic damage such as root resorption to the teeth.

In this study, multiple dental anomalies affected more than one-third of the CLP patients. The prevalence of certain dental anomalies was not the same in other similar studies. This could be the differences in ethnicity and environmental backgrounds. These patients required multiple dental treatments of orthodontic, restorative, prosthodontic, paediatric, and oral surgery attention. Good clinical outcomes could be achieved with a comprehensive multidisciplinary approach and regular reviews (Pastuszak et al., 2020), hence improving the quality of life of the patients (Ousehal et al., 2024).

Undoubtedly, there were limitations in this retrospective study. Data collection was fully dependent on the dental records, whilst clinical examination could provide more accurate information on the severity of the cleft and enamel hypoplasia. Meanwhile, the absence of some CLP patients due to poor socioeconomic status or difficulty accessing healthcare services could also influence the prevalence of dental anomalies. In addition, advanced statistical analyses might be helpful to check correlations between the severity of cleft and specific dental anomalies. Future studies were recommended to include the whole state of Sabah to investigate the differences in dental anomalies with specific ethnic and geographic backgrounds. Multi-centre studies might provide more accurate prevalence.

CONCLUSIONS

Almost all the CLP patients referred for orthodontic treatment had at least one dental anomaly, with a prevalence of 98.82%. Multiple dental anomalies affected more than one-third of the patients. Hypodontia was the most common dental anomaly, with lateral incisors most prevalent. Other dental anomalies were peg-shaped lateral incisors, impacted teeth, mostly impacted canine, supernumerary, and transposition. Early identification of dental anomalies in CLP patients is very important in treatment planning to allow timely referral to the multidisciplinary team.

CONFLICT OF INTERESTS

The author declared no conflict of interest in this research.

ACKNOWLEDGEMENTS

The author would like to thank the Director General of Health Malaysia and the Principal Director of the Oral Health Programme for the permission to publish this article.

REFERENCES

Ai Jamal, G.A., Hazza'a, A.M., & Rawashded, M.A. (2010). Prevalence of dental anomalies in a population of cleft lip and palate patients. The Cleft Palate-Craniofacial Journal; https://doi.org/10.1597/08-275.1

Akcam, M.O., Evirgen, S., Uslu, O., & Memikoglu, U.T. (2010). Dental anomalies in individuals with cleft lip and / or palate. European Journal of Orthodontics; 32(2): 207-213.

Al-Kharboush G.H., Al-Balkhi, K.M., & Al-Moammar, K. (2015). The prevalence of specific dental anomalies in a group of Saudi cleft lip and palate patients. The Saudi Dental Journal; 27: 75-80.

Boo, N.Y., & Arshad, A.R. (1990). A study of cleft lip and palate in neonates born in a large Malaysian maternity hospital over a 2-year period. Singapore Medical Journal; 31(1): 59-62.

Camporesi, M., Baccetti, T., Marinelli, A., Defraia, E., & Franchi, L. (2010). Maxillary dental anomalies in children with cleft lip and palate: a controlled study. International Journal of Paediatric Dentistry; 20(6): 442-450.

Chai, S.C., Jimeno, Z.K.L., Sasidaran, R., & Sergius, A. (2013). Pilot epidemiological study of cleft lip and / or palate in Kota Kinabalu, Sabah. Asian Journal of Medical Sciences; 4(3): 86-91.

Chang, C.H., Chang, C.H., Lai, J.P., Lin, S.S., & Chang, Y.J. (2022). Prevalence of Dental Anomalies in Taiwanese Children with Cleft Lip and Cleft Palate. Journal of Personalized Medicine; 12(10):1708. https://doi.org/10.3390/jpm12101708

Ezzeldin, M., Gee, S., Curtis, J., Clark, V.J., Smallridge, J., & Collard, M. (2023). Dental anomalies in cleft lip and / or palate children at age 10- a retrospective review across three cleft centres: Part 1. British Dental Journal; 234: 926-930.

Germec Cakan, D., Nur Yilmaz, R.B., Bulut, F.N., & Aksoy, A. (2018). Dental anomalies in different types of cleft lip and palate: is there any relation? The Journal of Craniofacial Surgery; 29(5): 1316-1321.

Haque, S., & Alam, M.K. (2015). Common dental anomalies in cleft lip and palate patients. Malaysian Journal of Medical Sciences; 22(2): 55-60.

Jamilian, A., Lucchese, A., Darnahal, A., Kamali, Z., & Perillo, L. (2016). Cleft sidedness and congenitally missing teeth in patients with cleft lip and palate patients. Progress in Orthodontics; 17:14.

Korolenkova, M.V., Starikova, N.V., & Udalova, N.V. (2019). The role of external aetiological factors in dental anomalies in non-syndromic cleft lip and palate patients. European Archives of Paediatric Dentistry; 20(2): 105-111.

Lasota, A. (2021). Dental anomalies in children with cleft lip with or without cleft palate. Journal of Pre-Clinical and Clinical Research; 15(1): 46-49.

Lehtonen, V., Anttonen, V., Ylikontiola, L.P., Koskinen, S., Pesonen, P., & Sándor, G.K. (2015). Dental anomalies associated with cleft lip and palate in Northern Finland. European Journal of Paediatric Dentistry; 16(4): 327-332.

Möller, L.S., Pradel, W., Gedrange, T., & Botzenhart, U.U. (2021). Prevalence of hypodontia and supernumerary teeth in a German cleft lip with/ without palate population. BMC Oral Health; 21: 60.

Naing, L., Nordin, R.B., Abdul Rahman, H., & Naing, Y.T. (2022). Sample size calculation for prevalence studies using Scalex and ScalaR calculators. BMC Medical Research Methodology; 22: 209. https://doi.org/10.1186/s12874-022-01694-7.

Namdar, P., Mesgarani, A., & Shiva, A. (2021). Prevalence of maxillary dental anomalies and related factors in children with cleft lip and palate in Sari. International Journal of Pediatric; 9(10): 14600-14607.

Nicholls, W. (2016). Dental anomalies in children with cleft lip and palate in Western Australia. European Journal of Dentistry; 10(2): 254-258.

Noraihan, M.N., Raja, R., & Symonds, E.M. (2005). Audit of birth defects in 34,109 deliveries in a tertiary referral centre. Medical Journal of Malaysia; 60(4): 460-468.

Ousehal, L., Sair, S., & Lazraq, A. (2024). Prevalence of dental anomalies among cleft lip and palate patients: a cross-sectional study. Open Access Library Journal; 11(4): doi:10.4236/oalib.1111385.

Paradowska-Stolarz, A., & Kawala, B. (2023). Dental Anomalies in Maxillary Incisors and Canines among Patients with Total Cleft Lip and Palate. Applied Sciences; 13(11):6635. https://doi.org/10.3390/app13116635.

Paradowska-Stolarz, A., & Kawala, B. (2014). Occlusal disorders among patients with total clefts

of lip, alveolar bone, and palate. Biomed Research International; http://dx.doi.org/10.1155/2014/583416.

Pastuszak, P., Dunin-Wilczyńska, I., & Lasota, A. (2020). Frequency of additional congenital dental anomalies in children with cleft lip, alveolar and palate. Journal of Clinical Medicine; 9: 3813: doi:10.3390/jcm9123813.

Pradhan, L., Shakya, P., Thapa, S., Nakarmi, K.K., Maharjan, A., Sagtani, R.A., & Rai, S.M. (2020). Prevalence of dental anomalies in the patient with cleft lip and palate visiting a tertiary care hospital. Journal of Nepal Medical Association; 58(228): 591-6.

Ross, R.B, & Johnston, M.C. (1972). Cleft lip and palate. Baltimore, Md: Williams and Wilkins Co; 81-82.

Sander, A.K., Grau, E., Bartella, A.K. et al. (2022). Dental anomalies and their therapeutic implications: retrospective assessment of a frequent finding in patients with cleft lip and palate. BMC Oral Health; 22, 553. https://doi.org/10.1186/s12903-022-02606-3.

Schwartz, J.P., Somensi, D.S., Yoshizaki, P., Reis, L.L.S., Lauris, R.C.M.C., Silva Filho, O.G., Dalbén, G., & Garib, D.G. (2014). Prevalence of dental anomalies of number in different subphenotypes of isolated cleft palate. Dental Press Journal of Orthodontics; 19(1): 55-9.

Shah, S.Y.A., Rahman, Z.A.A., Mirani, S.A., Shaikh, M.L., Khattak, M.N., & Sahito, M.A. (2015). Demographic data on the characterization of oral clefts in Malaysia. Pakistan Oral & Dental Journal; 35(1): 108-110.

Sharma, P., Khera, A.K., & Raghav, P. (2021). Role of orthodontists in cleft lip and palate. Journal of Oral Health and Craniofacial Science; 6: 008-015.

Shetye, P.R. (2016). Orthodontic management of patients with cleft lip and palate. APOS Trends of Orthodontics; 6: 281-6.

Thong, M.K., Ho, J.J., & Khatijah, N.N. (2005). A population-based study of birth defects in Malaysia. Annals of Human Biology; 32(2): 180-187.

Watted, N., Abdulgani, A., & Abu-Hussein, M. (2014). Supernumerary teeth in permanent dentition in patients with cleft lip and palate. International Journal of Dental and Health Sciences; 1(3): 410-418.

Wong, H.M., Lai, M.C., & King, N.M. (2012). Dental anomalies in Chinese children with cleft lip and palate. Dentistry; 2 (3): 127. Doi: 10.4172/2161-1122.1000127.