

CARIES EXPERIENCE AND ORAL HYGIENE STATUS IN A GROUP OF CLEFT LIP AND/OR PALATE IN ALEXANDRIA, EGYPT

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ABSTRACT

BACKGROUND: Cleft lip and/or palate are congenital malformations that involve the oral cavity and may also extend to affect the face due to incomplete fusion of sutures in the intrauterine life.

OBJECTIVES: Assess caries experience, oral hygiene and gingival status in children with cleft lip and/or palate (CLP) compared to a non-cleft control group.

MATERIALS AND METHODS: 152 children aged (4-12) years old, with cleft lip and/or palate (n=76) and non-cleft control (n=76) have participated in this study. Clinical examination assessed caries experience (dmft, dft and DMFT indices), plaque index and gingival index for both groups.

RESULTS: The median dmft, dft and DMFT indices scores were statistically higher in CLP group than control group at P= 0.033, P=0.047 and P=0.001 respectively. The median plaque index for CLP children was 1.55 whereas for non-cleft children, it was 1.30 with a statistically significant difference at P<0.0001. The median gingival index for CLP children was 1.50 whereas for control children it was 1.10 with a statistically significant difference P<0.0001*.

CONCLUSION: CLP children group have higher caries experience, poor oral hygiene and gingival status in comparison with non-cleft control group.

KEYWORDS: Cleft lip and palate, dental caries, plaque index.

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INTRODUCTION

Oral clefts are among the most frequent congenital defects in the cranio facial region (1). They are birth malformations involving the oral cavity and may also extend to involve the face (2). Cleft of the lip occurs due to partial closure of the two maxillary processes and can be unilateral or bilateral, complete or incomplete (3). Cleft of the palate occurs due to failure of two palatine shelves fusion in the early intrauterine life (4).

Cleft lip and/or palate (CLP) prevalence was estimated as 1.2 in every 1000 births (5). This prevalence differs between different populations with highest levels found in American and Asian populations (2 per 1000 live births) and the lowest level found in the African population (0.4 per 1000 live births) (6). In Egypt, El Semary et al., 2012 (7) conducted a cross-

sectional study at Ain Shams University to determine the prevalence of oral clefts in Cairo. The prevalence was found to be 3.85 per 1000 live births.

Cleft lip and/or palate children suffer numerous problems during their life as feeding problems due to inadequate lip seal and escape of fluids into the nose, hearing impairment due to recurrent ear infections, speech problems with nasality of voice and dental abnormalities (8-11). The management of such a deformity requires a multidisciplinary team approach including dental specialists, medical specialists and allied health care specialists (12). Such multidisciplinary management takes a very long time and requires both patients and parents awareness of all aspects of the treatment.

The anatomic defects exhibited in cleft lip and /or palate result in various functional and

psychological changes. These anatomical defects may result in various dental anomalies as incisor agenesis, supernumerary teeth, dental crowding, abnormalities in tooth formation and hypodontia (13).

These anatomic defects, also in combination with long term surgical interventions since childhood, as well as orthodontic and prosthodontic therapeutic interventions, may contribute to an increase in their susceptibility to dental caries and worsening of the periodontal condition (14). Teeth malalignment, oral soft tissue defects, unusual dental, skeletal and soft tissue growth resulting from the surgical repair may also lead to an increase in the incidence of dental plaque, bleeding on probing and gingival inflammation in CLP patients regardless the type of cleft (15). Al-Dajani et al., 2009 (16) evaluated the dental caries prevalence in oral cleft patients versus their non-cleft siblings, and according to the findings, children with cleft lip and palate were more susceptible to dental decay than their control counterparts.

In 2019 a study (17) was carried by Nguyen et al, in central Vietnam, to evaluate the periodontal conditions and level of dental caries in repaired CLP children. A total of 78 patients with CLP were examined for dental caries, gingivitis and periodontitis. **Patients** with corrected CLP had a greater degree of caries and a higher prevalence of gingivitis than non-cleft ones. Gheller et al., 2021 (18) assessed gingival and periodontal status in 58 CLP children in Brazil with age 6-18 years old. Gingivitis and periodontitis were found to be considerably greater in CLP children than in non-cleft children. A systematic review and meta-analysis was done by Grewcock et al., 2022 (19) to evaluate caries experience in CLP children in comparison to non-cleft children using data from twenty studies, it was shown that CLP children had higher levels of caries than non-cleft children.

On the other hand, Lages et al., 2004 (20) upon evaluating the oral health of cleft patients in Brazil, found that both dental and periodontal conditions of CLP children with age range (6-12) were as same as general population. Moreover in Brazil, Tannure et al., 2012 (21) compared the caries experience in children with cleft lip and/or palate with non-cleft children. Cleft children had lower caries experience than the non-cleft group. In 2021, Malay et al (22) conducted a study in India to analyze dental caries experience within a group of CLP children compared to non-cleft group. It was concluded that caries experience in the cleft-free group was higher.

Many studies (16-22) provided data on relationship between dental caries and oral hygiene status and cleft lip and/or palate but the results were conflicting. There is inadequate information about the oral health status among patients having cleft lip

and/or palate in Egypt. So, the purpose of this study is to fill that gap by evaluating cleft lip and/or palate children's caries experience, oral hygiene and gingival health status. The null hypothesis states that there is no difference in caries experience, oral hygiene, or gingival health between children who have cleft lip and/or palate and those who do not.

MATERIALS AND METHODS

This cross-sectional analytical study was conducted at the Faculty of Dentistry Alexandria University, in the period from 2019 to 2021.

Ethical Considerations:

The study was ethically approved by the Dental Research Ethics Committee, Faculty of Dentistry, Alexandria University with ethical approval reference number 0038-06/2019. Following an explanation of the study's goal to the parents, they were asked to sign an informed consent form. When necessary, children were referred to the Pediatric Dental Clinic for dental treatment.

Sample size estimation

Based on Baraka M., 2015, the minimum sample size required was found to be 76 patients per group, using a power of 80%, precision 5%, level of significance 95% (α error=0.05) and 95% confidence interval (23).

Study sample

152 children have participated in this study with age range 4 to 12 years old. CLP children (n=76) were recruited from the Cranio-maxillofacial and Plastic Surgery Department, Faculty of Dentistry, Alexandria University in addition to, an age matching control group (n=76) non-cleft children attending the Pediatric Dental Clinic, Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Alexandria University seeking for dental treatment. Children with systemic diseases, intellectual disabilities and syndromic cleft lip and/or palate children were excluded.

Data collection

Before examination for two groups, the researcher collected demographic data from child parent or guardian. It included child's name, sex and age. Parental education and occupation also have been noted.

Intraoral examination was performed under good illumination using dental mirror and explorer to determine the following

Caries experience (24): Decayed, missing and filled teeth were diagnosed by visual examination following the World Health Organization (WHO) criteria (28), using the dmft index for primary dentition and (dft and DMFT) indices for mixed dentition. A tooth was considered carious in case of presence of obvious cavitation on any of its surfaces. Missing teeth due to exfoliation were excluded from the indices. Tooth that

had a restoration for carious lesion on any of surfaces was registered as filled.

Oral hygiene condition (25): was evaluated using Silness and Loe plaque index (PLI) (29), by recording the thickness of plaque in the gingival one third of six index teeth. Examination was done by blunt Martin periodontal probe with Williams' calibration.

The six index teeth were: right maxillary second primary molar or right maxillary first permanent molar, right maxillary primary lateral incisor or right maxillary permanent lateral incisor, left maxillary first primary molar or left maxillary first premolar, left mandibular second primary molar or left mandibular first permanent molar, left mandibular primary lateral incisor or left mandibular permanent lateral incisor and right mandibular first primary molar or right mandibular first premolar. Missing teeth were excluded.

Index teeth were evaluated on four surfaces (buccal, lingual, mesial and distal) and given a score from 0-3.

The scores were given according to the following criteria (25)

0: No plaque.

1: A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen only by using the probe on the tooth surface.

2: Moderate accumulation of soft deposit s within the gingival sulcus, or the tooth and gingival margin which can be seen with the naked eye.

3: Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

The scores from the four areas of the tooth were added and divided by four in order to give the plaque index for the tooth then scores from the selected teeth are added and divided by the number of teeth examined to give the plaque index for the child.

Gingival condition: using Loe and Silness gingival index (GI) (26).

Plaque index and gingival index were evaluated for same index teeth using blunt Martin periodontal probe with Williams's calibration.

Gingival index was evaluated on disto-facial papilla, facial margin, mesio-facial papilla and lingual margin for each index tooth

The gingival score from 0 to 3 were given to each gingival unit according to the following criteria (26)

0: No Inflammation.

1: Mild inflammation, slight change in colour and slight edema, no bleeding on sampling.

2: Moderate inflammation, redness, edema, bleeding on sampling.

3: Severe inflammation, marked edema, ulceration, spontaneous bleeding.

The scores from the four areas of the gingiva were added and divided by four in order to give the gingival index for the tooth then scores from the selected teeth

are added and divided by the number of teeth examined to give the gingival index for the child.

Intra examiner reliability

Re-examination of 20 children with a time interval of at least 30 minutes between examinations was done at the Faculty of Dentistry, Alexandria University to establish intra-examiner reliability. Intraclass correlation coefficient (ICC) was used to determine intra-examiner agreement. The values ranged from 0.86 for the dmft to 0.98 for the DMFT, indicating excellent agreement.

Statistical analysis

The Kolmogorov Smirnov test, box plots, and descriptive statistics were used to determine normality. The mean, median, and interquartile range (IQR) were used to present quantitative variables. Count and percent were used to present qualitative variables. SPSS for Windows version 23 was used to analyze the data.

All qualitative variables were compared using Pearson Chi Square or Fisher Exact tests. Groups are compared regarding all quantitative outcomes using Mann Whitney U test.

RESULTS

A total of 152 children have been included in this study, 76 cleft lip and/or palate children (study group) and 76 non-cleft children (control group). Their age ranges were from 4 to 12 years. The mean age of CLP children was 7.05 years whereas the mean age of non-cleft group was 6.8 years. The CLP group consisted of 34 (44.7%) males and 42 (55.3%) females. The control group consisted of 36 (47.4%) male and 40 (52.6%) female. Regarding father's education 13 (17.1%) of CLP group were university graduates, 56 (73.7%) were middle and preparatory and 7 (9.2%) were illiterate. For the non-cleft group 24 (31.6%) of fathers were university graduates, 50 (65.8%) were middle and preparatory and 2 (2.6%) were illiterate. A statistically significant difference existed between the two groups. $P=0.011$.

Regarding mother's education 8 (10.5%) of mothers of CLP group were university graduates, 59 (77.7%) were middle and preparatory and 9 (11.8%) were illiterate. For the non-cleft group 23 (30.3%) of mothers were university graduates, 47 (61.8%) were middle and preparatory and 6 (7.9%) were illiterate with statically significant difference between the two groups $P=0.026$.

Caries experience among CLP and non-cleft children during primary and mixed dentition

Table 1 shows caries experience among CLP and non-cleft children with primary and mixed dentition. In children with primary dentition, the median (Inter Quartile Range) (dmft) for the CLP group was 5.00 (5.00) while that for controls was 5.00 (3.25) with a statistically significant difference between two groups $P=0.033$. In mixed dentition, the median (IQR) (dft) and

(DMFT) for CLP children was 5.00 (4.00) and 1.50 (3.00) respectively whereas for non-cleft children it was 4.00 (3.00) and 0.00 (1.00) respectively with a significant differences between both groups regarding the dft (P=0.047*) and DMFT(P=0.001*)

The decayed component (d) in both primary and mixed dentition was higher in CLP children than non-cleft children with statistically significant difference between both groups in the primary dentition P= (0.010*) and in the mixed dentition P= (0.044*) for primary teeth and (0.001*) for permanent teeth. In addition, in both primary and mixed dentitions, there was no significant difference in the missing (m) and filled (f) components. Non-cleft children had a larger filled component (f) in primary dentition than CLP children.

Oral hygiene and gingival condition of the study groups

Table 2 shows plaque and gingival indices of CLP and non-cleft children. The median (IQR) plaque index for CLP children was 1.55 (0.60) whereas for non-cleft children it was 1.30 (0.40) having a significant statistical difference at P<0.0001*. The Median (IQR) gingival index for CLP children was 1.50 (0.65) whereas for non-cleft children it was 1.10 (0.38) with a difference between the two groups that is statistically significant at P<0.0001*.

Table (1): Caries experience in primary and mixed dentition among the study groups.

Variables		Non-cleft (n=76)	With cleft (n=76)	Test (P value)
Primary Dentition	dmft	Media (IQR) [†] 5.00 (3.25)	5.00 (5.00)	Z= 2.137 (0.033)*
	d	Media (IQR) [†] 3.00 (3.00)	5.00 (5.00)	Z= 2.568 (0.010)
	m	Media (IQR) 1.00 (1.00)	0.00 (0.00)	Z= 1.848 (0.065)
	f	Media (IQR) [†] 0.00 (0.00)	0.00 (0.00)	Z= 0.105 (0.916)
Mixed dentition (Permanent teeth)	DMFT	Media (IQR) [†] 0.00 (1.00)	1.50 (3.00)	Z= 3.410 (0.001*)
	D	Media (IQR) [†] 0.00 (0.00)	1.00 (3.00)	Z= 3.332 (0.001*)
	M	Media (IQR) [†] -	-	

	F	Media (IQR) [†]	0.00 (0.00)	0.00 (0.00)	Z= 0.263 (0.792)
Mixed dentition (Primary teeth)	dft	Media (IQR) [†]	4.00 (3.00)	5.00 (4.00)	Z= 1.990 (0.047*)
	d	Media (IQR) [†]	3.00 (4.5)	5.00 (5.00)	Z= 2.012 (0.044*)
	f	Media (IQR) [†]	0.00 (2.0)	0.00 (0.00)	Z= 0.693 (0.488)

[†] (IQR) Inter Quartile Range
*Statistically significant at P value≤0.05

Table (2): Oral hygiene and gingival condition of the study groups.

Variables		Non-cleft (n=76)	With cleft (n=76)	Test (P value)
Plaque index	Median (IQR) [†]	1.30 (0.40)	1.55 (0.60)	Z= 4.837 (<0.0001*)
Gingival index	Median (IQR) [†]	1.10 (0.38)	1.50 (0.65)	Z= 4.644 (<0.0001*)

[†] (IQR) Inter Quartile Range
*Statistically significant at P value≤0.05

DISCUSSION

Children with CLP face many challenges through their lives that start just after birth including feeding problems in their early life and later on swallowing, speech, hearing, and occlusion problems. These challenges may negatively affect their life quality. The anatomic defects present in CLP can affect their oral health significantly. Oral problems represents a major healthcare issue among people with CLP (27, 28).

This was a comparative cross-sectional analytical research of a group of cleft lip and /or palate children and a group of non-cleft children. They were nearly matched for age with the purpose of obtaining a representative sample. The selection of this age range (4-12 years old) was to allow for the observation of different oral health problems that might be present during primary, mixed dentitions.

In the present study the caries experience dmft, dft and DMFT was significantly higher in CLP children than non-cleft children in both primary and mixed dentitions. The decayed component was also significantly higher in CLP children than non-cleft children in both primary and mixed dentitions which is in concordance with Al-Dajani et al., 2009 (16) Britton et al., 2010 (29), and Nguyen et al., 2019 (17) who also

demonstrated a higher caries experience in CLP children than non-cleft controls. This increase in caries experience in CLP children may be attributed to the increased difficulties that face caregivers like the numerous medical and surgical demands of these patients. Hence, little concern is given to dental care.

Moreover, the presence of scar tissue in the cleft area and the cleft anatomy cause parental reluctance to deal with the cleft area and the surrounding tissues therefore compromising the normal home dental care including brushing and flossing (15). Another contributing factor may be dry mouth due to the mouth breathing habit in cleft patients because of the abnormal dental and skeletal morphology (30). Moreover, the natural cleansing effects of the teeth may be compromised due to altered morphology (13).

Additionally, CLP children are more likely to receive dental treatments under general anesthesia so they are expected to receive more aggressive and definitive treatment plans than children who receive treatments on the dental chair to avoid retreatment, hence the greater likelihood of having higher dmft, dft and DMFT scores (31).

In a study carried by Shashni, et al., 2015 (32) to evaluate caries risk indicators in children with CLP compared to non-cleft groups. CLP showed more developmental dental defects and hypoplastic lesions on the enamel surfaces. In addition more sugar intake was recorded in the cleft children than the non-cleft group. It was also found that a more acidic potential of saliva and higher levels of streptococcus mutans were present among the cleft children group.

Among Egyptian population there is lack of proper dental services available to CLP children especially in rural regions as well as improper awareness of the importance of meticulous dental care to this group of children. Also the multidisciplinary team approach in managing CLP patients is not widely available in Egypt (33).

However, the findings of this research were in contrary with Legas et al., 2004 (20) who found no significant difference between CLP children and non-cleft children in caries experience and Malay et al., 2021 (22) who reported that caries experience of CLP group was lower than non-cleft group. These contradictory results may have occurred due to the difference in population assessed.

A wide variety of methodologies and indices have been used to evaluate the gingival and periodontal conditions, the gingival and periodontal indices are amongst the most widely used and accepted ones (30).

When evaluating the oral hygiene status in CLP children versus non-cleft children, the CLP group had considerably greater plaque and gingival index scores. Our results are supported by many previous studies that found more plaque accumulation in CLP

patients (14, 18, and 30). Major occlusal discrepancies in CLP patients usually hinder proper oral hygiene practices and encourage plaque accumulation so worsen the gingival status. Previous studies have shown that higher plaque indices were recorded specifically with unilateral cleft lip, palate and alveolus. These results however contradict with Lucas et al., 2000 (34) who concluded that plaque index did not differ significantly between cleft and non-cleft patients. This may be due to difference in methodology used.

Regarding the gingival condition, in the current study the gingival index of CLP children is significantly higher than that of non-cleft control group this may be due to more plaque accumulation and difficulty in maintaining proper oral hygiene as mentioned in previous studies (19, 20, 27). Also limited arch space in CLP patients, teeth malalignments and crowding are contributing factors for more plaque accumulation thereby worsen the gingival status (28).

The poor oral health observed in children with CLP compared to controls may be attributed to different factors. The presence of residual scar tissue due to the surgical repair impairs proper oral hygiene procedures. Cleft children have many serious health complications like otitis media and speech difficulties that cause caregivers to give dental care less interest. Also the different anatomy of the cleft area with loss of elasticity make cleft children fear brushing their teeth around the cleft area. In the present study, the low educational level of CLP parents may be another contributing factor to the poor oral hygiene in this group. This poor oral hygiene status found in CLP group could be a contributing factor for high caries experience and poor gingival status in the present study (13, 16, 35).

The present study findings indicate that CLP children need a large attention regarding their dental health, more dental services should be available to this vulnerable group. In Egypt, there is a persistent need to identify high risk groups of cleft patients and to implement vigorous preventive and oral hygiene measures into the treatment protocols of these patients. Priority needs to be given to the dental care of these children besides the medical care. Regular and comprehensive oral hygiene instructions need to be given. Restorative treatments need to be done instead of focusing only on emergency treatments. Regular dental check-ups are essential (12, 13). The multidisciplinary team approach system should be implemented in the treatment of CLP patients in Egypt since their birth and throughout their lives trying to interact to solve the many general and dental health challenges that face those patients and introduce the appropriate procedures at the appropriate time (33). Dentists should be an important part of the multidisciplinary team in managing CLP children just after birth to provide the appropriate procedure starting from the neonatal

prosthesis that help in the early feeding of CLP babies to the preventive, restorative and orthodontic procedures that those patients require to reach a better quality of life (12). In this study the null hypothesis was rejected.

This study has certain limitations include that it is region-specific so the patient sample may not be reflective of other populations in Egypt. Small study sample may be another limitation. Therefore, further studies should be carried in other regions, clinics and academic centers in order to validate this study findings on larger populations. It is also recommended to assess developmental enamel defects in CLP children and correlate it to their caries experience.

CONCLUSION

1. Cleft lip and/or palate children group have higher caries experience than an age matching non-cleft control group in both primary and mixed dentitions.

2. Cleft lip and/or palate children showed significantly poor oral hygiene and gingival status in comparison with non-cleft group.

CONFLICT OF INTEREST

The authors declare that there was no conflict of interests.

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