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Dental and oral hygiene status in Jordanian children with cleft lip and palate: a comparison between unilateral and bilateral clefts

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Hazza'a AM, Rawashdeh MA, Al-Nimri K, Al Habashneh R. Dental and oral hygiene status in Jordanian children with cleft lip and palate: a comparison between unilateral and bilateral clefts.

Abstract: *Objectives:* The purpose of this study was to assess and compare the dental health and oral hygiene status of subjects with unilateral and bilateral cleft lip and palate (BCLP). *Methods:* Oral and dental examinations were carried out in 98 children with cleft lip and palate and 98 unaffected subjects matching in gender and age, using the standard dental indices dmft and DMFT. Plaque and gingival indices were scored using the plaque and gingival indices of Silness and Löe. *Results:* The prevalence of dental caries was significantly higher in children with cleft lip and palate than their control in both permanent and deciduous teeth. Patients with BCLP experienced more dental caries than unilateral cleft lip and palate (UCLP) patients in both dentitions. Similarly, plaque accumulation and gingivitis were significantly higher in the cleft lip and palate patients compared with their controls. Only plaque accumulation was significantly higher in the BCLP patients than in the UCLP patients. *Conclusion:* Bilateral cleft lip and palate patients appear to be at a higher risk of caries experience and poorer in oral hygiene than those with UCLP patients. These findings not only provide a baseline for oral health parameters in patients with cleft lip and palate but also emphasize the need for intensive preventive measures of oral disease to optimize clinical outcome.

Key words: caries risk; cleft lip and palate; oral hygiene

Introduction

Clefting of the lip, cleft palate or both is the most common orofacial congenital malformation found amongst live births.

The birth prevalence of cleft lip with or without cleft palate has been reported to range from 1 in 700 to 1 in 1000 live births worldwide (1–5). Clefts of the lip and palate together are about twice as common as clefts of either the lip or palate alone (6, 7). Children who have cleft lip and palate often experience feeding, swallowing, speech and cosmetic problems as well as poor dental health (8).

Review of the literature yields conflict reports on oral and dental health of children with cleft lip and palate. Several groups of workers have reported that children with cleft lip and palate had higher caries prevalence and poorer oral hygiene than did unaffected children (9–11). For instance, Parapanision *et al.* (12) examined 41 Greek children with clefts and found that the oral hygiene of these children was poorer than that of a control group. Brägger *et al.* (13) examined 80 children with clefts and found that the percentage of tooth surface area covered with plaque was high in all cleft groups. It was also found that children with clefts exhibited poor oral hygiene as well as poor gingival and periodontal conditions. In a Swedish study, poorer gingival health was found in cleft children than in non-cleft children, and this difference was more marked when only the anterior regions were compared (11). In contrast Lucas *et al.* (14) investigated the oral hygiene status in 60 British children with cleft lip and palate and found no significant difference in plaque, and gingivitis scores between the cleft children and their controls.

A study of 285 Swedish cleft lip and/or palate children reported that caries experience of these children did not differ significantly from that of non-cleft children (15). Similar finding was reported also by Lucas *et al.* (14). Nevertheless, this finding was contradicted by other studies, where cleft lip and palate (CLP) children were found to have higher caries prevalence in both primary and permanent dentitions than unaffected children (9–11, 16–20). Recently, Stec-Slonicz *et al.* (21) assessed and compared the oral and dental status amongst Polish and German patients with cleft lip and palate and they found that caries experience and plaque index (PI) were much higher than in the general population. Furthermore, the prevalence of dental caries was reported to increase with severity of the cleft where children with bilateral cleft lip and palate (BCLP) had the highest percentage of carious teeth (10, 16, 22). The highest prevalence of dental caries in cleft lip and/or palate children was found in the teeth adjacent to the cleft and the molars (11, 18, 22). A variety of reasons have been suggested for the high caries prevalence in cleft lip and palate patients. Parents may focus on the numerous medical and surgical treatments with a low priority for dental care. In addition, the paucity of advice that the parents get on feeding and oral hygiene, the availability and the cost of dental care and travelling for long distances to dental clinics may limit the accessibility to dental care (23). Also, it has been postulated that irregularity of teeth may be another reason for a higher frequency of dental caries in cleft lip and palate patients (24). Furthermore, proper oral health care in cleft lip and palate patients may be hampered by the anatomy of the cleft area, surgery and surgical scar tissues and the limited mobility of the lip (11, 23).

Research with regard to the prevalence of dental caries in children with cleft lip and palate living in Jordan is lacking. Therefore, the purpose of this study was to investigate and compare the oral hygiene status of a sample of patients with bilateral and unilateral cleft lip and palate (UCLP).

Materials and methods

Subjects for this study were recruited from the cleft lip and palate centre at the King Abdullah University Hospital, North of Jordan. Only patients with both cleft lip and cleft palate were included in the study. Children with multiple abnormalities and/or recognized syndromes were excluded.

The institutional review board (IRB) approval was obtained from the ethical Committee of the Faculty of Medicine in Jordan University of Science and Technology. Informed consent was obtained from parents of all participants (diseased and healthy). The sample consisted of 98 patients, 51 males and 47 females; the mean age of the cleft sample was 11.7 ± 6.3 years with a range of 4–23 years and median of 10 years. Of those, 52 were with UCLP and 46 with BCLP. The distribution of the sample is indicated in Table 1.

Patients were divided into three different age groups: 4–8 years (n = 36), 8–12 years (n = 24) and above 12 years (n = 38). For the purpose of comparison and as an attempt to determine the validity of the findings obtained from examining the cleft lip and palate patients, a total of 98 unaffected group

Table 1. **The number of subjects distributed according to cleft type, gender and age**

	UCLP		BCLP		Control	
Age group	Male	Female	Male	Female	Male	Female
4–8	12	8	9	7	21	15
8–12	6	6	10	2	16	8
>12	4	16	10	8	14	24
Total	22	30	29	17	51	47

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

matching in gender and age were examined by the same examiner and under similar conditions.

The patients were examined in the Dental Teaching Centre at Jordan University of Science and Technology, Irbid. The teeth were examined in a standardized, systemic manner using dental mirrors and probes under standard operating illumination. Prior to examination, the teeth were gently dried by compressed air. Dental caries was determined and expressed by dmft for primary teeth and DMFT for permanent teeth according to the WHO criteria (25). The decisive criterion, a detectable softened floor and/or wall of the cavity, was applied for the diagnosis of caries. The plaque level of the sample was determined using mouth mirrors and dental probes after gentle drying of the teeth with an air jet. The thickness of plaque at the gingival area of all teeth was scored using the PI of Silness and Löe (26). Gingival health status was evaluated according to the criteria of the Löe and Silness (27) gingival index (GI).

Statistical analysis

The data obtained were analysed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA). The differences in dmft/DMFT, PI and GI between males and females and the differences between the UCLP and BCLP groups were measured employing Student's *t*-test. The differences of dental caries experience in the control and cleft groups were tested by one-sample *t*-test. *P*-values <0.05 were considered statistically significant.

Reproducibility of dental indices

Before the actual research, 15 subjects were randomly selected and examined by the main examiner (AMH). The same subjects were examined again after a 2-week period by the main examiner to assess intra-examiner agreement on recording indices for caries, PI and GI. The Kappa value of agreement for the presence and absence of dental caries, PI and GI was 0.947, 0.91 and 0.88 respectively. These demonstrate almost perfect agreement.

Results

Table 1 shows the total number of subjects examined according to cleft type, gender and age group. The proportion of males and females within the total sample was 52% and 48% respectively.

There was a highly significant difference in caries experience between cleft and non-cleft subjects in both deciduous (dmft 4.28 ± 4.19 versus 1.66 ± 1.440) and permanent dentition (DMFT 4.58 ± 5.37 versus 2.25 ± 2.04). However, when the age groups were considered, there was a significant difference between all age groups except for the 4–8 years old age group in permanent dentition (Table 2).

The mean dmft/DMFT score for the primary/permanent for each age group according to the cleft type is presented in Table 3. Although there was a slight increase in the caries level in the BCLP subjects in both primary and permanent teeth, this difference was not statistically significant. However, when the total sample was considered, it was found that the caries experience in the BCLP is significantly higher than in the UCLP in both permanent (5.96 ± 6.48 versus 3.42 ± 3.96) $P = 0.04$ and deciduous (5.51 ± 4.38 versus 3.13 ± 3.71) $P = 0.03$ dentitions.

Female patients had higher caries experience than male patients in both cleft types in the permanent dentition; (DMFT 4.30 versus 2.06 for the UCLP subject and 7.00

Table 2. **Dental status of the cleft subjects compared with the healthy groups according to age group**

Age group	Clefts dmft	Controls dmft	*P*-value	Clefts DMFT	Controls DMFT	*P*-value
4–8	4.52 ± 4.43	1.44 ± 1.33	0.000	0.40 ± 0.69	0.30 ± 0.48	0.34
8–12	3.85 ± 3.80	2.05 ± 1.53	0.009	1.68 ± 1.52	0.95 ± 0.78	0.006
>12	–	–		7.36 ± 5.90	3.52 ± 1.90	0.000
Total	4.28 ± 4.19	1.66 ± 1.440	0.000	4.58 ± 5.37	2.25 ± 2.04	0.000

Table 3. **Caries experience in primary teeth (dmft) and permanent teeth (DMFT) in each age group according to cleft type**

	dmft			DMFT		
Age group	UCLP	BCLP	*P*-value	UCLP	BCLP	*P*-value
4–8	3.55 ± 4.16	5.75 ± 4.58	0.14	0.14 ± 0.37	1.00 ± 1.00	0.07
8–12	2.22 ± 2.43	5.18 ± 4.28	0.08	1.09 ± 1.22	2.27 ± 1.61	0.06
>12	–			5.85 ± 4.05	9.05 ± 7.19	0.09
Total	3.13 ± 3.71	5.51 ± 4.38	0.03	3.42 ± 3.96	5.96 ± 6.48	0.04

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

versus 5.35 for the BCLP), while in the deciduous dentition, males showed more caries experience (dmft 3.68 versus 2.46 for the UCLP subject and 5.61 versus 5.33 for the BCLP), but the differences did not reach significance level (Table 4).

The distribution of the total dmft and DMFT ranged from 0 to 16 and from 0 to 27 respectively. The major contributors to the dmft and DMFT scores in both UCLP and BCLP were decayed teeth accounting for 83% and 74% of the total dmft and 71% versus 65% of the total DMFT respectively, thus the caries attack rate for the primary teeth was higher than for the permanent.

It was found that within the stage of permanent dentition, 36% of the UCLP subjects were caries-free compared with 18% of those with BCLP, whereas in the primary dentition, these proportions were 34% and 18% respectively.

The distribution of tooth type according to their status in both UCLP and BCLP is shown in Table 5. In primary teeth, molars accounted for 70.6% of the total caries activity with the second molars comprising 56% of the decayed teeth. Maxillary molars had a higher incidence of caries than mandibular molars with a ratio of 1.35:1. Canines were the least affected teeth in both primary and permanent dentitions with the maxillary canines having a higher incidence of caries (ratio 1.22:1). In permanent teeth, the molars were most frequently affected by caries constituting about 68.8% of the decayed teeth. Mandibular first molar had the highest incidence of caries attack accounting for 30% of the total decayed permanent teeth. Extraction because of caries and filled teeth was very low accounting for 6.3% of the primary teeth and 7% of the permanent. An important finding of this study is that 27% of cleft subjects aged 4–12years and 42% of those more than 12 years had at least five carious teeth.

The mean plaque and gingival scores for the cleft subjects and their controls are shown in Table 6. Highly significant differences were found in all age groups between cleft and control subjects. As shown in Table 7, when the oral hygiene status of cleft type UCLP and BCLP was assessed in terms of age groups, there were no significant differences. Whereas, when the total sample was considered, it was found that there was a significant difference between BCLP and UCLP in the PI index (1.89 ± 0.73 versus 1.56 ± 0.65) ($P = 0.02$), while no significant difference was seen between the two cleft types in the GI index (1.69 ± 0.77 versus 1.46 ± 0.60) ($P = 0.10$).

Table 8 shows that there was no significant difference in the oral hygiene status between UCLP and BCLP according to gender; however, the oral hygiene of both male patients and female patients with BCLP was found to be poorer than those with UCLP.

Twenty-four (52.2%) of the BCLP patients had poor oral hygiene (PI score≥2.0) compared with 30.8% of the UCLP patients. Severe inflammation was seen in 26.3% of the cleft sample. Only 5.1% had no plaque and 2% had normal gingiva.

Table 4. **Caries experience in primary teeth (dmft) and permanent teeth (DMFT) in each cleft type according to gender**

	dmft			DMFT		
Gender	UCLP	BCLP	*P*-value	UCLP	BCLP	*P*-value
Male	3.68 ± 3.80	5.61 ± 4.64	0.19	2.06 ± 2.89	5.35 ± 7.15	0.10
Female	2.46 ± 3.64	5.33 ± 4.09	0.09	4.30 ± 4.36	7.00 ± 5.30	0.11

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

Table 5. **The number and percentage of tooth type according to their status; sound, decayed, missing and filled teeth in each cleft type**

Dentition and tooth type	Number		Sound		Decayed		Missing		Filled	
	UCLP	BCLP	UCLP	BCLP	UCLP	BCLP	UCLP	BCLP	UCLP	BCLP
Primary teeth										
Molars	182	170	114 (62.6)	60 (35.3)	54 (29.6)	76 (44.7)	7 (3.9)	19 (11.2)	7 (3.9)	15 (8.8)
Canines	85	92	80 (94.1)	80 (87)	4 (4.7)	12 (13)	1 (1.2)	0 (0)	0 (0)	0 (0)
Incisors	124	101	108 (87)	75 (74.3)	16 (13)	22 (2.8)	0 (0)	4 (3.9)	0 (0)	0 (0)
Permanent teeth										
Molars	234	194	135 (57.7)	87 (44.8)	74 (31.6)	72 (37.2)	4 (1.7)	16 (8.2)	21 (9)	19 (9.8)
Premolars	192	149	177 (92)	106 (71)	9 (4.6)	27 (18)	3 (1.5)	11 (7.3)	3 (1.5)	5 (3.3)
Canines	111	82	106 (95.5)	75 (91.5)	3 (2.7)	4 (4.9)	1 (0.9)	3 (3.6)	1 (0.9)	0 (0)
Incisors	247	201	237 (96)	175 (87)	6 (2.4)	17 (8.5)	4 (1.6)	7 (3.5)	0 (0)	2 (1)

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

Table 6. **Oral hygiene status of the cleft subject compared with the healthy group according to age group as measured by gingival index (GI) and plaque index (PI) (mean ± SD)**

	GI			PI		
Age group	Clefts	Controls	*P*-value	Clefts	Controls	*P*-value
4–8	1.53 ± 0.88	0.84 ± 0.48	0.00	1.51 ± 0.73	1.02 ± 0.53	0.001
8–12	1.45 ± 0.55	0.99 ± 0.58	0.002	1.83 ± 0.65	1.18 ± 0.26	0.00
>12	1.67 ± 0.55	1.13 ± 0.37	0.00	1.84 ± 0.70	1.31 ± 0.45	0.001
Total	1.56 ± 0.69	0.99 ± 0.48	0.00	1.71 ± 0.71	1.17 ± 0.46	0.00

Table 7. **Oral hygiene status as measured by gingival index (GI) and plaque index (PI) (mean ± SD) in each age group according to cleft type**

	GI			PI		
Age group	UCLP	BCLP	*P*-value	UCLP	BCLP	*P*-value
4–8	1.50 ± 0.73	1.57 ± 1.06	0.81	1.46 ± 0.82	1.57 ± 0.62	0.64
8–12	1.27 ± 0.55	1.63 ± 0.52	0.11	1.61 ± 0.65	2.05 ± 0.59	0.09
>12	1.52 ± 0.47	1.83 ± 0.60	0.09	1.63 ± 0.47	2.06 ± 0.85	0.06
Total	1.46 ± 0.60	1.69 ± 0.77	0.10	1.56 ± 0.65	1.89 ± 0.73	0.02

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

Table 8. **Oral hygiene status as measured by gingival index (GI) and plaque index (PI) (mean ± SD) in each cleft type according to gender**

	GI			PI		
Gender	UCLP	BCLP	*P*-value	UCLP	BCLP	*P*-value
Male	1.55 ± 0.67	1.71 ± 0.77	0.42	1.59 ± 0.74	1.93 ± 0.75	0.12
Female	1.39 ± 0.53	1.64 ± 0.79	0.20	1.53 ± 0.60	1.83 ± 0.73	0.14

UCLP, unilateral cleft lip and palate; BCLP, bilateral cleft lip and palate.

Discussion

Reports regarding the prevalence of dental caries in cleft patients as well as the effect of the severity of the cleft on such disease are contradictory. However, such disagreement may be explained by the fact that dental caries is considered an infectious and transmissible disease of multifactorial aetiology and should be treated as such. Moreover, the ethnicity of the studied populations as well as the implementation and nature of preventive programmes may influence the outcome.

In Jordan, the overall prevalence rate for live births with cleft lip, cleft palate or both was 1.39 per 1000 live births. Forty-eight per cent of the clefts involved cleft lip and palate (28). Nevertheless, it is surprising that little information on the oral hygiene status of children with oral clefts in Jordan is available.

However, the results of this study showed that there was a high prevalence of caries in both permanent and deciduous teeth of cleft subjects in the different age groups. The number of carious teeth was more than twice as high in cleft subjects in comparison with their control groups. These findings confirm the results reported by other authors (20, 29, 30) and are in disagreement with that reported by Lucas *et al.* (14) and Lauterstein and Mendelsohn (15), who both showed that there were no significant differences in caries experience between clefts and non-cleft subjects. Moreover, the significant difference in the caries prevalence between cleft and non-cleft children was more evident in the deciduous dentition. This finding once again confirms the findings reported by Dahllöf *et al.* (11) and Hewson *et al.* (29). Possible explanations of such findings may include more difficulties with oral hygiene, a dry mouth caused by mouth-breathing habits, less natural cleaning of the teeth because of the morphology, poor function because of occlusal problems or different diet or feeding habits.

The result of this study has shown that irrespective of the age group and gender, BCLP subjects experienced significantly more dental caries than UCLP subjects did. For instance, it was found that on average, 65% of patients with UCLP and 82% of those with BCLP require various treatments pertaining to dental problems. This finding is controversial; several authors denied any correlation between the degree of clefting and oral hygiene status (11, 19, 22, 30). However, Paul and Brandt (22) reported that children with cleft palate or cleft lip had better oral health than those with cleft lip and palate; moreover, Johnsen and Dixon (10) found that the percentage of carious teeth in patients with BCLP was higher

than that seen in patients with UCLP, which is in agreement with our findings. These findings may indicate that children with BCLP type are at more risk of developing dental caries. It might be because of the extensive involvement of anatomical structures in such type of clefts.

This study has also shown significant differences between the mean GI and PI scores of the cleft subjects and their controls. These findings confirm those reported by other investigators who all reported that patients with oral clefts have poorer oral hygiene when compared with non-cleft patients(11, *22*–*24*), but contradict the findings of Lucas *et al.* (14) who found no significant difference in gingival and plaque scores between cleft and non-cleft subjects. This contradiction may be explained by the fact that these children are cared for in a multidisciplinary centre and receive preventive dental care from a very early age. Moreover, Paul and Brandt, (*22*) reported that the dental health of children with isolated clefts of the lip or palate was found to be better than the dental health of those with a cleft lip and palate. Nevertheless, a possible explanation of such findings suggests that other factors, such as the consequences of surgical repair of cleft lip and alveolus and the fear of brushing around the cleft area, may influence the maintenance of oral hygiene.

The alarming findings of this study are that only 35% of the total sample was caries-free and the oral hygiene status of our sample showed that more than half of the patients had moderate-to-abundant plaque accumulation. This finding suggests that both preventive and restorative dental health care is needed for the cleft patients. Dental caries is considered as an infectious and transmissible disease of multifactorial aetiology, and as the initiating factors of caries in patients with cleft lip and palate are numerous, the patient's susceptibility to caries will be greater than that of subjects without clefts. The lack of dental awareness, education, poor oral hygiene and improper dietary habits play significant roles in the prevalence of dental caries amongst cleft patients. This trend can be reversed only by initiating intensive preventive measures including education of parents and health care professionals on the higher caries susceptibility of children with clefts, prophylaxis, fluoride application and fissure sealant, dietary advice and providing adequate quality of dental care.

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