Oral Health in Children with Cerebral Palsy

Nouri Sumaya M, Alaki Sumer M, El-Ashiry Eman A

Pediatric Dentistry Department, Faculty of Dentistry, King Abdul-Aziz University, Jeddah, Saudi Arabia

Abstract

Aim: To assess the oral health status in a group of children with cerebral palsy and to compare it with healthy children in Jeddah, Saudi Arabia.

Study Design: 63 children diagnosed with cerebral palsy were recruited from centers for children with special health care needs, and 99 healthy controls were recruited from regular elementary schools. The ages of the children in both groups ranged from 6-12 years. An oral examination was conducted to determine the dental health, the oral hygiene and the gingival health. A questionnaire was used to determine the medical and dental histories of the children.

Results: More than half of the children in the CP group had caries and the mean DMFT+dft score was high. The majority of the children in that group had mild to moderate gingivitis and fair oral hygiene. There was no significant difference in oral health status between children with cerebral palsy and the controls. A significant association was found between the "reason for dental visits" and the dental health in the CP group (p=0.000).

Conclusions: The oral health status of children with CP in Jeddah, Saudi Arabia is not satisfactory, however it is not significantly different from that of healthy children in the same age group.

Key Words: Oral Health, Cerebral Palsy, Children

Introduction

The oral health status of children in Saudi Arabia is not satisfactory and dental caries are still considered a major problem. Studies show that the prevalence of dental caries is > 90% among Saudi school children [1-4]. Regarding the gingival health, studies have shown that gingivitis and bleeding gums are common findings among school-aged children [5,6].

Cerebral Palsy (CP) is the most common form of neuromuscular disability affecting children [7]. It has been defined as "a group of disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception and/or behavior and/or by a seizure disorder" [8].

In Saudi Arabia, the information regarding the prevalence of CP is limited, but according to available evidence it is one of the most common disabling conditions [9]. The Profile on Welfare and Disability in Saudi Arabia demonstrated that 35.3% of the disabilities were categorized as congenital which included CP [10]. From a recent community based study it was found that the prevalence of CP in Saudi Arabia was 2.34 in every 1000 [11].

Several studies have examined the caries and oral hygiene status in children who suffer from CP. In Saudi Arabia, children with CP were found to have very high caries experience, in addition, only few of these children benefitted from good oral hygiene [12]. Similar findings were reported in Brazil [13]. In China, children with CP had significantly higher plaque and gingival index scores. However, the caries experience was found to be similar between the CP and control groups [14].

Aim

In light of the previous findings, this study aims to assess the oral health status in children with CP and compare it with that of normally developing children in Jeddah, Saudi Arabia.

Null hypothesis

There is no difference in the oral health status between children with CP and normally developing children in Jeddah, Saudi Arabia.

Alternative hypothesis

The oral health status of children with CP is lower than that of normally developing children in Jeddah, Saudi Arabia.

Methods

The study design

It is a case-control study involving a group of children with CP acting as cases (CP group) and a group of healthy, normally developing children acting as controls. The work took place at the beginning of 2011 and was continued throughout the rest of that year and the following year (total 2 years).

Ethical considerations

The research was approved by the Research Ethics Committee of the Faculty of Dentistry in King Abdul Aziz University. The nature of the study was explained to the parents through an informed consent; in case of agreement they were requested to sign the written consent and provide their phone number. Further explanation was provided during the telephone interview. In addition, a brief report on the child's oral health was provided and the parents were free to ask any questions related to their child's oral health. Upon request, parents were also provided with a simplified written form explaining briefly their child's oral health status and treatment needs.

The sample

Regarding the CP group, an estimate of the number of children with CP who were enrolled in centers for Children with Special Health Care Needs (CSHCN) in Jeddah, Saudi Arabia was determined using a directory of private and public centers

Corresponding author: Dr. Sumaya Nouri, PhD student, Pediatric Dentistry Department, Faculty of Dentistry, King Abdul-Aziz University, Jeddah, Saudi Arabia, P.O. Box 54902, Jeddah 21524, Saudi Arabia; Tel: +966 12 6061334; Fax: +966 12 6952437; e-mail: snouri0001@stu.kau.edu.sa

in Makkah region issued in 2009 by king Abdullah bin Abdul-Aziz Disabled Children Association. The directory listed 32 centers that accepted children with CP. Of the 32 centers some were excluded according to the following criteria:

1. Providing wrong contact information.
2. Refusing to participate in research work.
3. Reporting poor parental cooperation in research work.
4. Hosting less than 5 children meeting the inclusion criteria.
5. Providing physical therapy only and not a complete rehabilitation program.

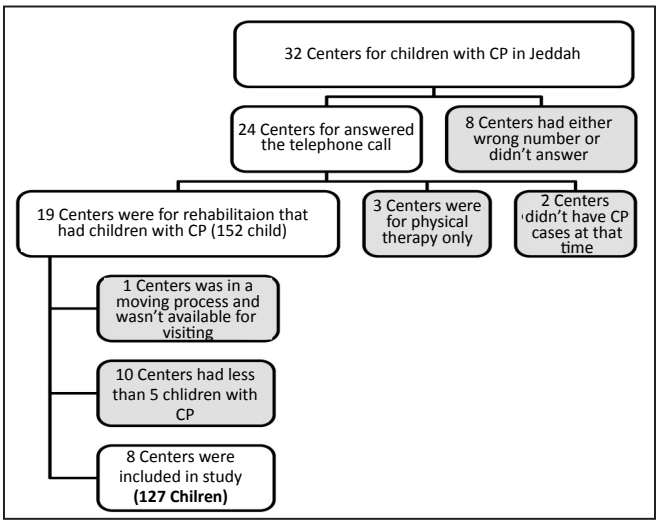
A total of 24 centers for CSHCN were contacted, of those only 8 centers were included in the study (1 public and 7 private). *Figure 1* explains the sampling process for the CP group. From the 8 centers that were included, the children chosen to participate in the study had to meet the following inclusion criteria:

1. Children diagnosed with CP and free from any other medical condition.
2. Boys and girls were included with ages ranging from 6-12 years.
3. Parents of the included children must be able to understand Arabic or English.

Regarding the control group, 5 elementary schools were randomly selected from the same areas of the included centers for CSHCN. This was done to ensure similar socioeconomic levels in the 2 groups. 2 public schools (1 for boys and 1 for girls) were selected and 3 private school (2 for boys and 1 for girls). From each of the selected schools, 40 children were randomly selected from the 6 levels of elementary school. Because one of the boys' private schools obtained additional amounts of consents, a total of 320 children received consent forms. Children in the control group fulfilled the same inclusion criteria mentioned earlier except for having CP.

The examination

A brief oral examination was conducted to assess the oral health status of the children. Examinations were conducted in the schools/centers of the children by calibrated examiners after receiving parental consent. A flash light was used to enhance visibility and disposable mirrors and gauze were used to facilitate the examination. All examinations were visual, and no probes were used due to the difficult behavior of the children in the CP group, and to ensure the safety of the child and examiner during the examination process.



*Grey boxes were excluded from the sample.

***Figure 1**. The process of collecting the sample for the CP group.*

The dental health was assessed using the decayed, missing, filled teeth index (DMFT) for permanent dentitions and the decayed, filled teeth index (dft) for primary dentiotions. Primary missing teeth were not recorded to avoid the misleading effect of exfoliation. The caries levels were categorized according to the WHO classification as very low (0-1.1), low (1.2-2.6), moderate (2.7-4.4), high (4.5-6.5) or very high (>6.6) [15].

The gingival health was assessed using the Visual Periodontal Index [16]. The scoring for this index went as follows: (0) if the gingival tissue was healthy, appearing pink and firm;

(1) If there was swelling and redness of the gingiva next to the tooth surface(s) either localized or generalized;

(2) The gingival tissue appears bright red, gross loss of contour (form), and/or visible bleeding along gum margin.

The oral hygiene was determined using the Simplified Oral Hygiene Index (OHI-S) [17]. The indicated teeth were examined visually, and the amounts of debris or calculus were recorded separately in the examination sheet. Oral hygiene was considered good when the score was from 0-0.9, fair if the score was from 1-1.9 and poor if the score was >2 [18].

The questionnaire

The questionnaire was done through telephone interview and it consisted of 3 parts: Form (A), Form (B), and Form (C).

In the first part of the questionnaire (Form A) parents were asked to provide the name, date of birth, gender, telephone number (mobile and land line), number of siblings, the order of the child in the family whether first, second, third or more, both parents' education level, and whether the mother is working or not. The education level choices were college, diploma, school or illiterate. The aim of these questions was to inquire about the child's family and their socioeconomic level.

The second part concerned with the medical history (Form B) contained a list of common medical conditions where parent had to check (Yes) if the child suffers from that problem or (No) if not. Children with seizures were not excluded from the study. Two more questions were added also, the first one asking if the child takes medication on regular basis and if he does the names should be mentioned. The second was regarding previous hospitalization and the reason for it. This was mentioned to know if any of the children had dental treatment done for them under GA, or if they have had tonsillectomy and adenoidectomy.

Questions on the medical history of the child are important to rule out any other medical condition, and to know if the child was taking medication on regular basis.

The third part was concerned with the oral and dental history of the child (Form C) and it included 8 multiple choice questions where the parent had to choose one of the presented answers. The first question was on the number of dental visits, whether the child went once, twice or more, or never visited the dental office in his life. The reason for those visits whether it was due to pain or as part of a comprehensive treatment plan or just for regular checkup was the second question. The third question was about the frequency of sugar consumption,

the fourth was about the frequency of brushing. The fifth was about and supervision of brushing, whether the child brushes unsupervised, or whether the parent brushes or only supervises the child while brushing or whether someone else supervises the brushing. The last three questions were (Yes or No) questions asking whether the child practiced any of the following habits: food pouching while eating (storing food in cheeks and not swallowing it or chewing it), mouth breathing or tooth grinding.

Statistical analysis

All data were entered and processed using the SPSS software (18.0, SPSS Inc., Chicago Ill, USA). The inferential statistical tests carried out were: the independent t-test for equal variance, the Welch's test for unequal variance, and the Chi square test to determine relationships between the variables. The Pearson correlation test was used to determine the intra-examiner reliability. The Cronbach alpha was used for measuring the inter-examiner reliability. Significance was set at $p<0.05$.

Results

The sample

The response rates of the centers for CSHCN in the CP group are demonstrated in *Table 1* and the response rates of the schools in the control group are demonstrated in *Table 2*.

Demographic data of the children in the two groups showed no significant difference in the gender, distribution between public and private centers and schools, number of siblings, and order of the child in the family. Regarding the mother working or not, it was found that the percentage of working mothers in the control group was significantly higher than that in the CP group (39%, 24% respectively, $p=0.029$). The fathers' level of education showed a significant difference between the 2 groups ($p=0.002$) in the CP group, the majority (49%) were high school graduates while in the control group the majority (66%) were college graduates. The mothers' level of education showed no significant difference. These findings are summarized in *Table 3*.

The examination

In the CP group, 65% of the children suffered from dental caries, 86% had mild to moderate gingivitis, and 73% had fair oral hygiene. The examination showed that the mean Total DMFT score was 5.12 (± 7.38) for the children in the CP group, which puts them in the 'high' category, and was 4.28 (± 3.37) for the children in the control group putting them in the moderate category. However this difference was not statistically significant. The oral hygiene assessed by the OHI-S or the gingival health indicated by the Visual Periodontal Index didn't show any significant difference between the CP group and control group. *Table 4* demonstrates the details of the DMFT/dft scores as well as the mean scores for the OHI-S and the Visual Periodontal Index for both the CP and control groups.

The questionnaire

Significantly more children in the CP group consumed medications on regular bases ($p=0.000$) and reported being previously hospitalized ($p=0.000$). Regarding the dental history, a summary of the percentage distribution of the items listed in this section is provided in *Tables 5 and 6*.

The relationship between the intra-oral indices scores and the demographics, medical and dental histories in the CP group

There was no significant association found between any of

Table 1. *The number of consents forms sent and returned the number of children who were examined and who completed the questionnaire and the response rates of centers for CSHCN in the CP group.*

Center	Number		Response Rate (%)	Number		Response Rate (%)	Total Number	
	Sent	Returned		Examined	Completed		Boys	Girls
Public Center								
Center 1	46	25	54.3	25	25	54.3	11	14
Private Centers								
Center 1	30	14	46.7	14	14	46.7	8	6
Center 2	10	4	40	3	3	30	1	2
Center 3	10	5	50	5	5	50	2	3
Center 4	5	2	40	2	2	40	1	1
Center 5	9	6	66.7	5	5	55.6	4	1
Center 6	5	2	40	2	2	40	2	0
Center 7	12	8	66.7	7	7	58	1	6
Total	127	66	51.9	63	63	49.6	30	33

Table 2. *The number of consents forms sent and returned the number of children who were examined and who completed the questionnaire and the response rates of schools in the control group.*

School	Number		Response Rate (%)	Number		Response Rate (%)
	Sent	Returned		Examined	Completed	
Public Schools						
Boys	40	27	67.5	22	19	47.5
Girls	40	25	62.5	25	25	62.5
Private Schools						
Boys	200	42	21	40	40	20
Girls	40	16	40	16	15	37.5
Total	320	110	34.4	103	99	30.9

Table 3. *Percentage distribution of the demographic characteristics for the CP and control groups.*

Demographic Variables	CP Group		Control Group		X^2	*p*-value*
	(n=63)	(%)	(n=99)	(%)		
Center/School Type						
Public	25	39.7	44	44.4	0.36	0.550
Private	38	60.3	55	55.6		
Gender						
Male	30	47.6	59	59.6	2.23	0.092
Female	33	52.4	40	40.4		
Number of Siblings						
2 or less	24	38.1	30	30.3	1.05	0.196
More than 2	39	61.9	69	69.7		
Order of Child						
First	19	30.2	16	16.2	4.48	0.106
Second	10	15.9	20	20.2		
Third or more	34	54	63	63.6		
Mother's Occupation						
Not working	48	76.2	60	60.6	4.21	0.029
Working	15	23.8	39	39.4		
Father's Education						
Illiterate	2	3.2	0	0	14.87	0.002
School	31	49.2	25	25.3		
Diploma	6	9.5	9	9.1		
College	24	38.1	65	65.7		
Mother's Education						
Illiterate	5	7.9	3	3	6.23	0.101
School	23	36.5	27	27.3		
Diploma	2	3.2	11	11.1		
College	33	52.4	58	58.6		

*Is significant when $p<0.05$.

Table 4. *The means and p-values of the DMFT/dft, OHI-S, and the Visual Periodontal index in the CP and control Groups.*

Examination	CP Group	Control Group	t-value	*p*-value*
	Mean (± SD)	Mean (± SD)		
Total DMFT (DMFT+dft)	5.12 (± 7.38)	4.28 (± 3.37)	-0.99	0.326
DMFT	0.87 (± 1.51)	1.32 (± 1.7)	1.72	0.088
dft	3.6 (± 3.64)	2.89 (± 2.93)	-1.31	0.193
D (Decayed Permanent)	0.6 (± 1.17)	0.67 (± 1.17)	0.34	0.737
d (Decayed Primary)	2.65 (± 3.37)	1.98 (± 2.55)	-1.35	0.179
M (Missing Permanent)	0.13 (± 0.71)	0.14 (± 0.7)	0.13	0.899
F (Filled Permanent)	0.14 (± 0.8)	0.52 (± 1.17)	2.4	0.018
f (Filled Primary)	0.95 (± 2)	0.91 (± 1.67)	-0.15	0.882
Visual Periodontal Index	0.86 (± 0.35)	0.82 (± 0.39)	-0.645	0.520
OHI-S	1.13 (± 0.6)	1.14 (± 0.66)	1.6	0.112

*Is significant when $p<0.05$.

the studied demographic variables and neither of the total DMFT, OHI-S nor the Visual Periodontal Index scores in the CP group. There was no significant association found with the medical history as well. Regarding the dental history, a statistically significant relationship was found between the "reason for dental visit" and the total DMFT score (p= 0.000). Post hoc tests revealed that the significant difference was in the "pain" and "checkup" reasons. The mean total DMFT score in the children who reported visiting the dentist due to pain in their oral cavity was 7 (± 3.46) while the mean in the children who visited for checkup only was 1.81 (± 1.79). The other variables in the dental history part of the questionnaire including the oral habits didn't show any significant association with neither the total DMFT, OHI-S nor the Visual Periodontal Index scores. These findings are demonstrated in *Tables 7-10*.

Discussion

The response rates in this study may indicate that centers for CSHCN are eager to participate in researches and studies for the benefit of their students. The lower response rate in private schools and centers may be attributed to the reluctance of persons in charge to call and follow up with the parents regarding the consents.

Regarding the demographic information, in the CP group 61.9% of the children had more than 2 siblings in the house; also, 54% of the children in the CP group were the third or more children in the family. This may indicate that these

Table 5. *The percentage distribution of the dental history findings for the CP and control groups.*

Dental History	CP Group		Control Group		X^2	*p*-value*
	(n=63)	(%)	(n=99)	(%)		
Number of Dental Visits						
Once	9	14.3	18	18.2	21.8	0.000
Twice	14	22.2	19	19.2		
More	17	27	53	53.5		
Never	23	36.5	9	9.1		
Reason for Dental Visit						
Pain	18	45	41	45.6	4.35	0.114
Comprehensive treatment plan	5	12.5	24	26.7		
Check up	17	42.5	25	27.8		
Frequency of Daily Sugar Intake						
None	5	7.9	3	3	9.72	0.021
Once	20	31.7	48	48.5		
2-3 times	30	74.6	28	28.3		
>3 times	8	12.7	20	20.2		
Frequency of Daily Brushing						
Doesn't Brush	3	4.8	1	1	0.24	0.026
Once	33	52.4	33	33.3		
2 times	2	4.9	51	51.5		
> 2 times	5	7.9	14	14.1		
Brushing Supervision						
Parent brush	41	66.1	7	7.1	5.06	0.000
Parent supervise	17	27.4	29	29.3		
Child brush	3	4.8	59	59.6		
Other supervise	1	1.6	4	4		

* Is significant when $p<0.05$.

Table 6. *The percentage distribution of the oral habits findings for the CP and control groups.*

	CP Group		Control Group		X^2	*p*-value*
	(n=63)	(%)	(n=99)	(%)		
Bruxism						
No	37	58.7	86	86.9	16.68	0.000
Yes	26	41.3	13	13.1		
Pouching of Food						
No	47	74.6	93	93.9	12.27	0.000
Yes	16	25.4	6	6.1		
Mouth Breathing						
No	48	76.2	75	75.8	0.00	0.950
Yes	15	23.8	24	24.2		

*Is significant when $p<0.05$.

children would receive lower attention and less care and are more prone to neglect than if they were the first or only child, especially if the family was of a low socioeconomic level. This also may be one of the reasons behind the low response rate that was found in the CP group.

The findings of this study showed that there were less working mothers in the CP group. This may indicate that mothers of children with CP may not have the time to work, and would rather stay home to take care of their disabled child. These findings were in agreement with the findings of Lemos and Katz and Brehaut et al. [19,20].

The father's occupation was not included in this research because no reference was found categorizing the jobs in Saudi Arabia as high socioeconomic or low socioeconomic jobs. There was no statistically significant difference regarding the mother's education level between the two groups, which was in agreement with the findings of Brehaut et al. [20]. The Fathers' education level however, showed a statistically significant difference between the 2 groups. The education level of fathers in the CP group was lower, which was in agreement with the findings of Lemos and Katz [19].

A significant difference was found regarding medication and previous hospitalization, this was in agreement with the findings of Jan who stated that the management of children with CP usually involves a combination of physical and occupational therapy, medications, and orthopedic and neurosurgical procedures [21].

The questionnaire used in this study was essentially a collection of questions that are commonly used when addressing the dental history. The number of children in the control group who visited the dentist 1 time or more in their life was higher than that in the CP group. While the number of children who reported never going to the dentist was higher in the CP group. This finding comes in agreement

Table 7. *The relationship between the demographics and the intra-oral indices in both groups.*

Demographic Variables	Total DMFT (n=63)		OHI-S (n=63)		Visual Periodontal Index (n=63)	
	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*
Center Type						
Public	4.52 (± 3.91)	0.603	0.99 (± 0.45)	0.115	0.84 (± 0.37)	0.757
Private	5.52 (± 9)		1.21 (± 0.67)		0.87 (± 0.34)	
Gender						
Male	5.32 (± 9.95)	0.839	1.02 (± 0.5)	0.189	0.88 (± 0.33)	0.613
Female	4.94 (± 3.98)		1.22 (± 0.66)		0.83 (± 0.38)	
Number of Siblings						
2 or less	6.32 (± 10.97)	0.316	1.21 (± 0.62)	0.400	0.92 (± 0.28)	0.262
More than 2	4.38 (± 3.82)		1.1 (± 0.58)		0.82 (± 0.39)	
Order of Child						
First	7.37 (± 12.13)	0.277	1.21(± 0.51)	0.646	0.95 (± 0.23)	0.294
Second	3.57 (± 3.71)		1.91(± 0.64)		0.90 (± 0.32)	
Third or More	4.32 (± 3.73)		1.06(± 0.64)		0.79 (± 0.41)	
Mother's Occupation						
Not working	4.6 (± 3.72)	0.551	1.2 (± 0.59)	0.065	0.86 (± 0.36)	0.906
Working	6.8 (± 13.8)		0.88 (± 0.57)		0.87 (± 0.35)	
Father's Education						
Illiterate	8 (± 5.66)	0.599	1.4 (± 0.85)	0.594	0.50 (± 0.71)	0.446
School	6.06 (± 9.71)		1.2 (± 0.59)		0.90 (± 0.30)	
Diploma	2.33 (± 1.86)		1.13 (± 0.33)		0.83 (± 0.41)	
College	4.36 (± 4.15)		1.01 (±0.64)		0.83 (±0.38)	
Mother's Education						
Illiterate	7.6 (± 3.5)	0.573	1.48 (± 0.89)	0.195	0.80 (± 0.45)	0.921
School	3.48 (± 3.27)		1.13 (± 0.46)		0.87 (± 0.34)	
Diploma	6 (± 8.49)		1.75 (± 0.64)		1.0 (± 0.00)	
College	5.84 (±9.54)		1.04 (±0.62)		0.85 (0.36±)	

*Is significant when $p<0.05$.

Table 8. *The relationship between the intra-oral indices scores and the medical history in the CP group.*

Medical History	Total DMFT (n=63)		OHI-S (n=63)		Visual Periodontal Index (n=63)	
	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*
Taking Medication						
No	5.81 (± 8.71)	0.274	1.09 (± 0.62)	0.451	0.86 (± 0.35)	0.942
Yes	3.59 (± 3.22)		1.21 (± 0.55)		0.85 (± 0.37)	
Previous Hospitalization						
No	4.8 (± 3.56)	0.815	0.99 (± 0.56)	0.199	0.70 (± 0.47)	0.051
Yes	5.27 (± 8.64)		1.19 (± 0.61)		0.93 (± 0.26)	

*Is significant when $p<0.05$.

with the findings of Pope and Curzon [22], but disagrees with Oredugba [23].

This may be explained by the fact that parents of disabled children may find it hard to take their child to the dentist due to several reasons some of which are the child's behavior and lack of cooperation the child is likely to show in the dental office, the difficult access to dental care, and the fact that most of those parents are preoccupied by the child's medical care [9]. The inability or unwillingness of some general dentists to treat children with special needs is an important reason for the unavailability of dental care for this group of children. A study was conducted in Saudi Arabia showed that Saudi dental students lack the confidence to render care to CSHCN even though they are willing to treat these patients [24]. In the United States, they found that most general dentists thought that their undergraduate dental education did not prepare them well to treat CSHCN [25].

The frequency of tooth brushing was also found to be significantly higher in the control group. This finding was not in agreement with the findings of Rodrigues dos Santos et al. [13]. Regarding the brushing supervision, the results showed a significant difference between the 2 groups. In the CP group, 66% of the parents brushed for their children. This is in agreement with the findings of Lemos and Katz [19].

Bruxism was found to be significantly higher in the CP group which was in agreement with the literature [13]. As for food pouching which was found to be also significantly higher in occurrence in the CP group, the same study by Rodrigues dos Santos showed that the presence of food residues was higher among children with CP when compared with normal children, they explained this finding by the inability of the tongue, lips, and cheeks to perform normal deglutition [13]. In relation to mouth breathing however, there was no significant difference found between the 2 groups which disagree with findings of Rodrigues dos Santos et al. [13].

The presence of dental caries did not differ between the two groups, although the mean of the total DMFT (DMFT + dft)

Table 9. *The relationship between the intra-oral indices scores and the dental history in the CP group.*

Dental History	Total DMFT (n=63)		OHI-S (n=63)		Visual Periodontal Index (n=63)	
	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*
Number of Dental Visits						
Once	3.56 (± 3.36)	0.756	1.18(± 0.63)	0.754	0.78 (± 0.44)	0.234
Twice	6 (± 3.88)		0.97 (± 0.36)		0.71 (± 0.47)	
More	4.1 (± 3.57)		1.17 (± 0.54)		0.94 (± 0.24)	
Never	5.96(± 11.32)		1.17 (± 0.74)		0.91 (± 0.29)	
Reason for Dental Visit						
Pain	7 (± 3.46)	0.000	1.01 (± 0.26)	0.633	0.83 (± 0.38)	0.494
Comprehensive treatment plan	5.6 (± 3.05)		1.24 (± 0.56)		1.00 (± 0.00)	
Check up	1.81 (± 1.79)		1.11 (± 0.67)		0.76 (± 0.44)	
Frequency of Daily Sugar Intake						
None	3.54(± 5.17)	0.824	1.12 (± 0.65)	0.983	1.00 (± 0.00)	0.297
Once	6.25(± 12.08)		1.16 (± 0.71)		0.95 (± 0.22)	
2-3 times	4.97 (± 3.7)		1.1 (± 0.56)		0.80 (± 0.41)	
> 3 times	3.88 (± 2.64)		1.18 (± 0.47)		0.75 (± 0.46)	
Frequency of Daily Brushing						
Doesn't brush	4 (± 4.58)	0.806	1.37 (± 1.29)	0.775	0.67 (± 0.58)	0.338
Once	5.64 (± 9.6)		1.17 (± 0.51)		0.91 (± 0.29)	
2 times	5.17 (± 3.85)		1.06 (± 0.62)		0.86 (± 0.35)	
> 2 times	2.2 (± 2.17)		1.02 (± 0.68)		0.60 (± 0.55)	
Brushing Supervision						
Parent brush	4.97 (± 8.8)	0.945	1.34 (± 0.6)	0.843	0.80 (± 0.40)	0.488
Parent supervise	4.82 (± 3.75)		1.04 (± 0.51)		0.94 (± 0.24)	
Child brush	6.33 (± 2.89)		1.07 (± 0.4)		1.00 (± 0.00)	
Other supervise	9		0.71		1.00	

*Is significant when $p<0.05$.

Table 10. *The relationship between the intra-oral indices scores and the oral habits in the CP group.*

Oral Habits	Total DMFT		OHI-S		Visual Periodontal Index	
	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*	Mean (± SD)	*p*-Value*
Bruxism						
No	5.7 (± 9.16)	0.461	1.12 (± 0.57)	0.901	0.84 (± 0.37)	0.608
Yes	4.3 (± 3.61)		1.14 (± 0.64)		0.88 (± 0.33)	
Pouching of Food						
No	3.8 (± 3.37)	0.134	1.13 (± 0.65)	0.949	0.87 (± 0.34)	0.562
Yes	9 (± 12.99)		1.12 (± 0.42)		0.81 (± 0.40)	
Mouth Breathing						
No	4.54 (± 3.89)	0.500	1.18 (± 0.65)	0.085	0.83 (± 0.38)	0.253
Yes	7 (± 13.61)		0.96 (± 0.31)		0.93 (± 0.26)	

*Is significant when $p<0.05$.

in the CP group was higher, but this was not significant. These findings are in agreement with the findings of Rodrigues dos Santos et al. and Pope and Curzon [13,22]. On the contrary, Oredugba and De Camargo and Antunes found higher caries in children with CP [23,26]. When addressing the the means of the decayed, missing and filled teeth in the primary and permanent teeth separately, it can be noted that the main component of the score was the "decayed" part in both types of dentition, this is similar to the finding of Oredugba [23]. It can also be noted that children in the control group had significantly a higher mean of filled permanent teeth when compared to the CP group. It has been reported previously that more treatment had been performed on permanent dention than on primary [26], this may suggest that the treatment of children with CP are not fulfilled, particularly in the permanent dentition.

Regarding the oral hygiene of the two groups, there was no significant difference found which was not in agreement with the findings provided in the literature [13,22,23,26]. This may be attributed to the fact that the children in the CP group didn't exhibit poor oral hygiene as it would be expected because most of the centers for CSHCN that were visited encouraged tooth brushing after the breakfast. On the other hand, in the control group, the level of oral hygiene was less than optimum, and as the results of this study show, almost 60% of them brushed their without supervision.

Concerning the gingival health, the Visual Periodontal Index was chosen specifically for this research because it

would give estimation on the gingival health without having to use a probe or any instrument. Insertion of any intra oral instrument was really difficult in children with CP especially as the examinations were not conducted in the clinic and the proper assistance and restraints were unavailable. The results of this study disagreed with Pope and Curzon and Du et al. [22,14]. This disagreement may be attributed to the fact that children in the control group had poor gingival health.

The absence of association between the total DMFT, OHI-S and Visual Periodontal Index and the demographic variables indicates that these factors didn't affect the type of care and amount of attention the child was is getting. This disagrees with what has been found in Brazil which was that the dental profile of children and adolescents with CP benefited from being cared by people that had completed at least the basic schooling level and worsened by the presence of more than one sibling in the family. They also found in that study that gender and whether the mother worked or not didn't affect the dental health of the child which is similar to the present results [26].

The frequency of sugar intake and the frequency and supervision tooth brushing didn't show a correlation with any of the intra-oral indices, which was in agreement with the findings of De Camargo and Antunes [26].

In light of the findings of this study, the following recommendations are proposed:

1. To conduct a similar study including children with CP who were not covered in the present sample. Children could be recruited from hospitals, clinics, or even from their homes.

2. To have a member from each of the centers for CSHCN and schools trained and educated to identify oral problems using simple examination methods such as the ones used in this research.

3. A manual aided with pictures could be provided in order to help in identifying oral conditions and problems in the beginning and refresh their memory when needed.

4. To increase the awareness of dental professionals toward this group of children in particular and to CSHCN in general, starting by dental students. This could be achieved by enrolling the students in programs that allow them to visit those children in their centers so they can be familiar with their environments and needs.

5. It is also beneficial to have dentists visit the centers for CSHCN on regular basis to provide educational lectures and to examine the children.

Limitations

1. Children who are not enrolled in rehabilitation centers were not included in the study.

2. The validity and reliability of the questionnaires used was not tested.

3. Examinations were conducted in less than optimum conditions which may compromise the accuracy of the examination.

Conclusions

From the findings of this study it can be concluded that the oral health status of children with CP in Jeddah is not very satisfactory, although it did not differ significantly from that of normally developing children. And that for children with CP, "pain" as a reason for visiting the dentist was significantly associated with a higher Total DMFT score.

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