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Oral and Dental Status in Children with Congenital Heart Disease in Ibn Rochd University Hospital of Casablanca Morocco

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ABSTRACT

Objective: A case-control survey was conducted to assess the oral status of children with congenital heart disease in the cardiothoracic department at the CHU Ibn Rochd in Casablanca.

Methods and Materials: The study involved 60 sick children and 60 healthy control children taken from the orthopedic and pediatric traumatology department at CHU Ibn Rochd in Casablanca. The statistical tests used were the Chi2 test for comparison of percentages and the Student test for comparison of means. Socioeconomic level, LOE and SILNESS gingival index, parents' assistance in their children's oral brushing, LOE and SILNESS plaque index, amelar hypoplasia, and cad/ CAO index were evaluated.

Results: The gingival index of the target group was higher compared to controls (0.579± 0.537 vs. 0.232±0.459) with a statistically significant association ($p < 10\text{-}3$).

The mean cao index of the target group was 4.633±4.687 vs 3.902±3.838 in the control group. The mean cao index was also higher in the case group compared with the control group (1.950 with a standard deviation of 3.456 vs 1.455 with a standard deviation of 1.856). The difference was statistically significant between the two groups for cao and CAO, respectively ($p=0.04$, $p < 10\text{ -}4$). Ameloid hypoplasia showed a statically insignificant difference ($p=0.54$) between the two study groups.

All these data show the need to develop a closer collaboration between all health professionals, including cardiologists, for an early oral management and for an optimal awareness of oral hygiene.

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Introduction

Congenital heart disease can be defined as malformations of the heart and/or vessels, present at birth, and also includes malformations related to the abnormal persistence after birth of structures normally present during fetal life [1].

The total prevalence of reported congenital heart disease has increased substantially over the past century, reaching a stable estimate of 9 per 1000 live births over the past 15 years [2]. There is a few national published data on the prevalence of the congenital heart disease, according to a study conducted at the Mohammed VI University Hospital in Marrakech. In Morocco, in 2020, the incidence of congenital heart disease was 1.8/1000 (0.18%) Affected children require special oral management because of their high exposure to develop infective endocarditis, whose main portal of entry is the oral cavity [3]. The most common microorganism involved is viridans streptococcus (55% of cases) [4].

The general condition of these children can have repercussions on their oral condition. Similarly, oral pathology can worsen the morbidity and quality of life of these patients. It is therefore essential to recognize these oral disorders, to prevent them or to manage them earlier.

Several studies have shown that children with heart disease have a more defective oral hygiene than their healthy counterparts [5-7]. In Morocco, a first study was carried out in 1999 at the Ibn Rochd University Hospital of CASABLANCA in order to raise awareness of this population and to evaluate their treatment needs.

Despite tangible progress in the therapeutic and surgical management of congenital heart disease, there is a huge lack of data concerning oral health and the need for treatment in these patients. In this context, we conducted a comparative case-control

survey, the main objective of which was to assess the oral status of children with congenital heart disease followed in pediatric cardiology and cardiovascular surgery department at the Ibn Rochd University Hospital of Casablanca, and to compare this status with their healthy counterparts.

Materials and Methods

The present study involved 60 children with congenital heart disease and 60 healthy controls taken from the orthopedics and pediatric traumatology department at the Ibn Rochd University Hospital of Casablanca, one control for each case. The data collection was done at the cardiology and cardiovascular surgery department at the Ibn Rochd University Hospital of Casablanca.

The survey included children aged less than 16 years old, with congenital heart disease who attended the department for a consultation or a follow up. Children with another pathology associated with congenital heart disease were excluded from the study.

For the control group, a match was made between the target group and the control group regarding age, sex, and socioeconomic level. Any subject with a general pathology was excluded from this group.

The collection of information was done by oral examinations and by filling in two questionnaires (one for the cases and the other for the controls), carried out by the same and unique investigator. Each questionnaire (case and control one) was composed of 5 parts: identification of the patient, cardiac pathology, lifestyle habits, evaluation of the level of information on oral health, and description of the oral condition. This data collecting was done over a period of 2.5 months.

The socioeconomic level of the parents was recorded according to the family's income in relation to their work (level 1, 2 or3) [5]. The level of oral hygiene was evaluated using LOE and SILNESS plaque index (ref) and the degree of gingival inflammation using LOE and SILNESS gingival index. Snack frequency is a variable that tells us about the number of snacks per day. The DMFT index for permanent teeth was determined by the missing (M) of a tooth, the presence of decay cavity (D) or a coronal filling (F). And the dmft index for the temporary teeth. The enamel hypoplasia, was evaluated according to the presence or not of an alteration in the enamel structure visible with the naked eye.

Quantitative variables were expressed by their means and standard deviation, and qualitative ones by their effective and percentage. The Chi square test was used to compare percentages and the Student test for comparison of means. A p value < 0.05 was considered as statistically significant.

Table 1: Distribution of Study Groups by Snack Consumption Frequency

Frequency of snacks	Target group		Control group		p
	N	%	N	%	
< 2 times/day	7	11 ,6%	0	0%	0 ,03
≥2 times /day	53	88,3%	60	100%	
1					

Results

Results showed that daily snack consumption varied between the two study populations, the healty children had more frequency of consumption of snacks in between meals. In the target group, the consumption of snacks was greater than or equal to 2 times/day for 53 cardiac children (88.3%), and in the control group, all of children (100%) had 2 or more intakes per day; this difference observed between the cases and control groups was statistically significant (p = 0.03) (Table 1).

Table 2: Distribution of the Parental Tooth Brushing Assistance

	Target group		Control group		p
	N	**%**	**N**	**%**	
YES	13	21,7%	4	6,7%	0,01
NO	47	78,3%	56	93,3%	0,03

Among the two populations surveyed, the parental tooth brushing assistance was greater in the target group (13 children in the target group versus 4 children in the control one, were assisted by their parents in brushing their teeth) with a statistically significant difference (p = 0.01) (Table 2).

Table 3: Plaque Index and Gingival Index of the Both Groups

Index	Target group	Control group	p
Mean value of plaque index	0,93±0,65	0,74±0,72	0,12
Mean value of gingival index	0,57± 0,53	0.23±0,45	< 10-3

The results for the plaque index of the cases ranged from 0 to 2.54. For the control group: the plaque index ranged from 0 to 2.41. Although there was a higher mean score in the case group compared with the controls (0.93 ± 0.65 vs. 0.74 ± 0.72), this difference was not statistically significant (p= 0.12). On the other hand, the data provided on the gingival index revealed a statistically significant association (p < 10-3), with also a high mean value in the target group compared to the controls (0.57 ± 0.53 vs 0.23 ± 0.45) (Table 3).

Table 4: Distribution of Enamel Hypoplasia for Both Groups

Enamel hypoplasia	Target group		Control group		p
	N	%	N	%	
Presence	7	11,7%	5	8,3%	
Absence	53	88,3%	55	91,7%	0,54
Total	60	100%	60	100%	

Table 4 shows the distribution of enamel hypoplasia in both of populations, 7 sick children (11.7%) vs. 5 controls (8.3%) had enamel hypoplasia. The difference was not statically significant (p = 0.54). The mean dmft index of the target group was 4.63 ± 4.68 versus 3.90 ± 3.83 in the control group.

Table 5: Distribution of dmft and DMFT Indexes According to Both Groups

	Target group	Control group	p
DMFT index	1,95	1,45	10-4
Dmft index	4,63	,,92	0,04

The mean DMFT index was also higher in the case group compared to the control group (1.95 ± 3.45 vs 1.45 ± 1.85). The difference was statistically significant between the two groups for dmft (p = 0.04) and for DMFT (p < 10 -4) (Table 5).

Discussion

Considering the direct impact of poor oral health in children with congenital or acquired heart disease, our survey was conducted with the objective of closely assessing the oral health of this population.

This study showed a significant difference between the target group children and their healthy counterparts regarding the frequency of snack consumption in favor of the sick children. Nevertheless, Pourmoghaddas et al, found that healthy children had significantly higher carbohydrate consumption [8]. Hallet et al in 1992 did not find a significant correlation in the frequency of consumption of sweets between the children of the two groups [9]. Our results agree with those of Azrak et al. in 2006, who found a significant difference in the frequency of sweets consumption between the two groups in favor of the target group [10].

Studies have explained this significant difference by the fact that parents of children with chronic diseases (such as congenital heart disease) tend to spoil their children with sugary snacks [4]. Other studies have justified this by the hyporexia of these children, which often leads parents to allow children to consume sweets and sugary drinks at will (between main meals, at night), thus endangering their oral conditions [11].

According to our results, sick children get more help from their parents when brushing their teeth compared to their healthy counterparts, with a statistically significant difference. This agrees with a study conducted in Syria in 2006 that also found a significant correlation between the two groups of children regarding parental assistance during tooth brushing in favor of sick children [10].

The studies explained this data by the awareness of the parents of sick children through the recommendations of doctors and the sometimes-exaggerated medical overprotection of these parents towards the fragile health condition of their children [4].

In contrast to these data, Nosrati et al, in 2013 in the United States, found similar parental supervision between the target and control groups, and they attributed these results to the high age range of their sample (mean =10.5 ± 0.4 years old) [2].

Our results regarding the plaque index detected a non-significant difference between the two study groups, which may support our previous data on parental assistance of their sick children in brushing and the close monitoring maintained by them in terms of oral and general health in favor of their children. This can also be interpreted by the improvement in the level of knowledge of the parents and consequently of their children in relation to their oral hygiene.

Gingival inflammation was greater in the target group than the controls with a mean gingival index of 0.57 and 0.23 for the sick children and their healthy counterparts, respectively. Schulz-Weidner et al in 2021 in Germany also revealed a significant difference in gingival index between the target and control groups [12]. Taken together, these data were similar to the results provided by Hiba Med Ali et al in 2017 in Sudan who found significantly higher gingival inflammation in sick children compared to healthy ones [13]. The studies attributed these results to the chronic and excessive use of drugs (anticoagulants, antihypertensive drugs...) which affects the periodontal and gingival status of cardiac children compared to healthy ones [4, 14].

In addition, the present study revealed no significant difference regarding enamel hypoplasia between the two groups studied, with a respectively high prevalence in the diseased group compared to the control group of (11.7% vs 8.3%).

This agreed with the results of the study conducted in 2018 in Norway by Sivertsen et al, who interpreted the high prevalence of enamel hypoplasia in the temporary dentition despite the early surgical management of these children in recent years, by the fact that cyanosis and heart failure cause hypoxia in the peripheral tissues which may interfere in the development of the dental organ in intrauterine life [15].

In this study the calculated dmft index was higher in the target group compared to the control one (4.63 ± 4.68 versus 3.90 ± 3.83 respectively) with a significant difference. Our results are comparable to those of the study performed by Sivertsen et al in 2018 with a dmft index for the target and control group of 4.03 ± 3,16 and 5,96 ±4,21 , respectively, and to those of the SChulz-Weidner study conducted in 2021, which also found no significant difference in the dmft index between the two groups studied [12-15]. On the other hand, the difference in the dmft index was significant for Hiba Med Ali et al [13] in Sudan, who found the values of dmft

index for both target and control groups to be = 4.1 ± 3.9 and 2.3 ± 2.9 respectively. And for CHowdhurry et al in India, who found a mean dmft of 2.42 ± 3.82 in the cardiac group vs. 2.32 ± 6.68 in the control group [4].

With regard to the DMFT index, the difference was significant between the patient and control groups (1,95 ± 3,45 and 1.45 ±1,85 respectively). Our results are comparable to those of CHowdhyrry and al in 2019, who detected a mean of 2.15 ± 3.38 in the patient group vs [4]. 1.27±1.89 in the control group. Neverthless other investigations found no statistically significant correlation between the DMFT indexes [8-16].

In addition, various medications that are prescribed for children with congenital heart disease have a direct impact on oral health by acting on saliva, plaque, mucosa and gingiva. Similarly, studies by Stecksen-Blicks et al and Linda Rosén et al, have shown that exposure to digoxin (Lanoxin) is strongly associated with the prevalence of caries in children with congenital heart disease due to its high sucrose content [17,18]. Beta-blockers and diuretics can also generate significant xerostomia and lichenoid reaction [4-14].

Conclusion

In this study, children with congenital heart disease had significantly higher gingival inflammation and dmft and DMFT indexes than their healthy counterparts. These findings are of concern because they pose a precarious risk to their health and consequently to their lives, due to their high susceptibility to infective endocarditis.

Closer collaboration between all health care professionals, including cardiologists and dentists, is needed to identify high-risk children, to provide early oral health care if necessary, and to provide oral health education to sick children and their parents, in order to improve the oral health related quality of life of this population.

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