AL-AZHAR
Dental Journal
For Girls

The Official Publication
of The Faculty of Dental
Medicine For Girls,
Al-Azhar University
Cairo, Egypt.

Print ISSN 2537-0308 • Online ISSN 2537-0316

ADJ-for Girls, Vol. 10, No. 1, January (2023) — PP. 247:257

Effectiveness of an Oral Health Intervention Program for Group of Egyptian Children with Congenital Heart Defects

Heba A. Abourady[1]*, Magda A. El-Malt[2], Salam El-Araby[3], Amira E. El-Tantawy[4]

Codex : 3-09/23.01

azhardentj@azhar.edu.eg

http://adjg.journals.ekb.eg

DOI: 10.21608/adjg.2022.86694.1401

Pediatric Dentistry & Orthodontics
(Pediatric Dentistry, Orthodontics)

ABSTRACT

Purpose: This study evaluated an oral health program on group of Egyptian children with congenital heart defects and healthy children. **Materials and Methods:** This study was conducted on a sample group of 110 Egyptian children with age (3 to 6) years old with congenital heart defect and healthy children. In each groups number of girls nearly equal number of boys. The oral health status was evaluated regarding to Intra oral examination of oral tissue and teeth, (dmf) index used to assess dental caries in primary teeth in primary dentition stage, gingival index, and oral Hygiene index (OHI-S) was also measured. **Results:** Regarding gender, there was no statistically significant difference. There was no statistically significant difference between median dmf scores in the two groups (*P*-value = 0.760, Effect size = 0056). normal group showed statistically significantly lower median GI scores than CHD group (*P*-value <0.001, Effect size = 1.985), (*P*-value <0.001, Effect size = 1.59), (*P*-value <0.001, Effect size = 0.736) and (*P*-value = 0.004, Effect size = 0.432), respectively. **Conclusions:** Oral health program on Egyptian children with congenital heart improves teeth caries and significantly improves gingival index and oral Hygiene index (OHI-S).

KEYWORDS

Congenital heart defects, gingival index, oral health, oral Hygiene index (OHI-S).

- Paper extracted from Master thesis titled "Effectiveness of an Oral Health Intervention Program for Group of Egyptian Children with Congenital Heart Defects"

1. Dentist at Ministry of Health and Population, Benha, Egypt.
2. Assistance Professor of Pediatric Dentistry, Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Al-Azhar University, Cairo, Egypt.
3. Lecturer of Pediatric Dentistry, Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Al-Azhar University, Cairo, Egypt.
4. Professor of pediatrics, Faculty of Medicine, Cairo University, Egypt.

* Corresponding author email: hebaabourady@gmail.com

INTRODUCTION

Dental health is one of the most important health problems for children. Although the relationship has been established between oral health and endocarditis, The prevalence of dental caries, periodontitis and saliva in relation to a healthy population is controversial, and in comparison, to children with congenital cardiac conditions (CHDs)[1].

Children with specific health care needs may have behavior issues, developmental difficulties, cognitive disorders, congenital or genetic disorders, or systemic diseases [2].

These disorders may put them at increased risk for oral illness, so that preventative oral health interventions are vital in their early years. These children should be cared for at home. Preventive care can be initiated and maintained by an age of one year. Dentists can develop younger prevention care by knowing the situation of the kid and how it effects oral health care [3].

Children with congenital heart defects (CHD) are exposed to many oral health risk factors [3]. In many cases, oral health is no priority for all other medical concerns for parents. Parental care focuses on chronic disease, not oral health [1].

The child with CHD receives the proper treatment combination, therapeutic catheterization, and open-heart surgery. A phased method that palliates but cannot fix a large structural defect is typically necessary for complex anomalies. Various medicinal products are utilized in children with CHD who, through modifying saliva, plaque, mucous membranes, and gingiva, may have an impact on dental health. Drug interaction is possible if dentistry is prescribed [4]. The CHD occur in approximately 8;1000 live birth [5].

Deficiencies can be classified as light, moderate or serious. The risk factors of oral health characteristic for a group in children with moderate and severe CHD. Air and heart work can lead to frequent dinners even during the night and to difficulties feeding, frequent vomiting, malabsorption, and increased energy need [6].

An infection with the internal heart surface (endocardium), including the heart valves is the infection of the infectious endocarditis (IE). It still has high mortality and severe complications in spite of improved management of IE [7].

Untreated oral illnesses posing a risk for bacteremia like periodontitis or untreated dental caries have been observed and are etiologically influenced by IE [8].

In children who are medically affected, the outcome of sepsis of oral origin can certainly be lethal. Nevertheless, not all parents of children with CHD are conscious of the risks of getting IE from poor oral health [7].

In more than 60% of the patient with positive streptococcal viridian hemoculture (*S. mutans, S. mitior*), the cause of an infective endocarditis is thus mandatory for the maintenance of oral health of these children [9].

Recent IE prevention guidelines have reduced to some CHD types the antibiotic prophylactic indications. Rather, they stress the necessity of good dental health [10].

SUBJECTS AND METHODS

This study evaluated oral health program on group of Egyptian children with congenital heart defect and healthy children. The sample was divided into two groups; the first group contains 55 children with congenital heart defect at Abo-Elreesh hospital and the second group contains 55 of healthy children. The research ethics were performed after approval by the Committee of the Faculty of Dental medicine for Girls, Al-Azhar University, Cairo, Egypt (ethics code; REC-PE-21-04).

Sample size estimation and statistical power

The calculation was estimated using CDC Epi Info program version 7.2.0.1 (Atlanta, USA) assuming a power of 80% and alpha=0.05 to detect significant difference in oral health among group of children with congenital heart defect and healthy children. A total sample of 110 children (55 each group) is needed based on an estimated prevalence of Gingival bleeding 4.2% of children with congenital heart defect (intervened by oral health program) compared to 21.3% in healthy children (control group) [11].

Subjects

This study was conducted on a sample group of 110 Egyptian children with age (3 to 6) years old with congenital heart defect and healthy children. In each group; the number of girls nearly equal the number of boys.

Inclusion criteria [11]

Egyptian children with congenital heart defects with age (3 to 6) years old and healthy children.

Exclusion criteria [11]

Egyptian children have no disability other than congenital heart defects and don't take any drugs other than congenital heart defects treating drugs.

Sample selection

Group (1): 55 healthy children.

Group (2): 55 children with congenital heart defect.

Methods

Every child in this study was subjected to:

1- Intra oral examination of oral tissue and teeth according to chart:

Through a diagnostic aid including plane mouth mirror, Explorer dental probe and blunt periodontal probe using gingival index and simplified oral hygiene index.

Referral parent of each child for filling or extraction of decayed teeth and follow up their response. (See appendix 1).

A dental examination chart was tilled to assess the soft and hard tissue condition.

Figure (1) Toothbrush and the articulator.

Primary Teeth Index

Decayed-missing-filled index

Index (dmf) was used to assess dental caries in primary teeth in primary dentition stage [12].

The (dmf) index represents:

i- (d) decayed primary teeth indicated lot filling

ii- (m) missed primary teeth due to caries

iii- (f) filled primary teeth with permanent restorations.

Gingival Index

To assess the gingival condition and record qualitative change in gingival, the Gingival index (Gl) has been designated. The bleeding is gently evaluated by examining the soft tissue of the gingival sulcus on the wall. The seriousness of gingival is indicated on a scale between 0 and 3 [13].

(0) healthy gingiva.

(1) Mild gingivitis.

(2) Moderate gingivitis.

(3) Severe gingivitis.

It is a partial registration system; 6 teeth were selected to be tested, any of these teeth missing were replaced by a comparable adjacent tooth.

Oral Hygiene index simplified (OHI-S)

The OHI-S has two components, the Debris Index, and the Calculus Index [14,15].

Calculation of OHIs

The index values are calculated after the values for waste and computation are recorded. For all, the scores of the debris are added and divided by the scored area. Following the scoring for a group of individuals, the average scores are obtained by computing. The Debris index simplified is average individual or group score (Dl-s).

The same methods are employed for calculation values or simplified the calculus index (Cl-s). For simplifying oral hygiene, average individual or group waste and calculus scores are combined.

The CI-s and Dl-s values may range from 0 to 3 and the OHI-S values from 0 to 6.

i- Debris Index simplified = (The buccal-scores) + (The lingual-scores)/6.

ii- Calculus Index simplified= (The buccal-scores) + (The lingual-scores) 16.

2- Survey questionnaire:

Survey questionnaire will be completed by the parent of each child to gather data about oral hygiene health before and after the program follow up period will take three months.

Approval of ethical committee and patient consent form will take (see appendix 2).

STATISTICAL ANALYSIS

Kolmogorov-Smirnov and Shapiro-Wilk tests was checked the distribution of data and using tests of normality. Age data showed parametric distribution while dmf, GI and OHI-S scores data showed non-parametric distribution. The mean, standard deviation (SD), median and range was described the data. The student test was applied to compare the parametric data between the two groups while the test Mann Whitney U was used as non-parametric data. Friedman's test was used to study the changes by time in GI and OHI-S scores. When Friedman's test is significant, the Dunn test was used for pair-wise comparisons. Qualitative data were presented as frequencies and percentages. Chi-square test was used for comparisons between the two groups ($P \leq 0.05$).

Statistical analysis was performed with SPSS, Version 23.0. Armonk, NY: IBM Corp.

RESULTS

A. Demographic data

There was no statistically significant difference between mean age values in the two groups. There was also no statistically significant difference between gender distributions in the two groups.

Table (1) *Mean, standard deviation (SD), frequencies (n), percentages and results of Student's t-test and Chi-square tests for comparisons of demographic data in the two groups*

	Normal (n = 59)	**CHD (n = 55)**	***P*-value**
Age (Years)			
Mean (SD)	4.33 (1.04)	4.67 (1.19)	0.105
Gender [n (%)]			
Boy	35 (59.3)	29 (52.7)	0.478
Girl	24 (40.7)	26 (47.3)	

**: Significant at P ≤ 0.05*

B. Caries index (dmf)

There was no statistically significant difference between median dmf scores in the two groups (*P*-value = 0.760, Effect size = 0056).

Table (2) *Descriptive statistics and results of Mann-Whitney U test for comparison between dmf scores in the two groups*

Dmf	Normal (n = 59)	CHD (n = 55)	*P*-value	*Effect size (d)*
Median (Range)	4 (0 – 12)	4 (0 – 12)	0.760	0.056
Mean (SD)	4 (3.15)	3.71 (2.77)		

**: Significant at P ≤ 0.05*

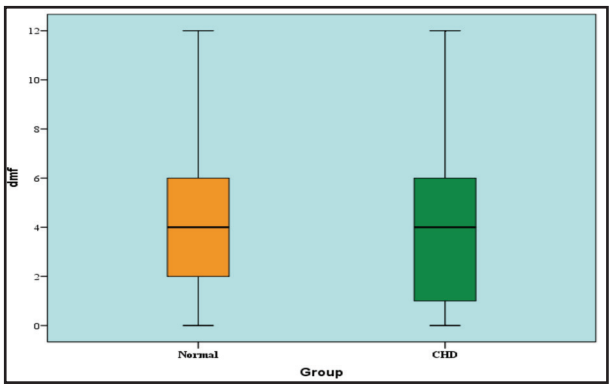

Figure (2) Box plot representing median and range values for dmf scores in the two groups

C. Gingival Index (GI)

1. Comparison between the two groups

At base line, first, second as well as third visits; normal group showed statistically significantly lower median GI scores than CHD group (*P*-value <0.001, Effect size = 1.985), (*P*-value <0.001, Effect size = 1.59), (*P*-value <0.001, Effect size = 0.736) and (*P*-value = 0.004, Effect size = 0.432), respectively.

Table (3) *Descriptive statistics and results of Mann-Whitney U test for comparison between GI scores in the two groups*

Time	Normal (n = 59)		CHD (n = 55)		*P*-value	*Effect size (d)*
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Base line	1 (0 – 3)	0.93 (0.64)	2 (1 – 3)	2.17 (0.58)	<0.001*	1.985
First visit	0 (0 – 2)	0.29 (0.53)	1 (0 – 2)	1.19 (0.56)	<0.001*	1.59
Second visit	0 (0 – 1)	0.17 (0.38)	1 (0 – 2)	0.62 (0.66)	<0.001*	0.736
Third visit	0 (0 – 1)	0.07 (0.25)	0 (0 – 1)	0.27 (0.45)	0.004*	0.432

**: Significant at P ≤ 0.05*

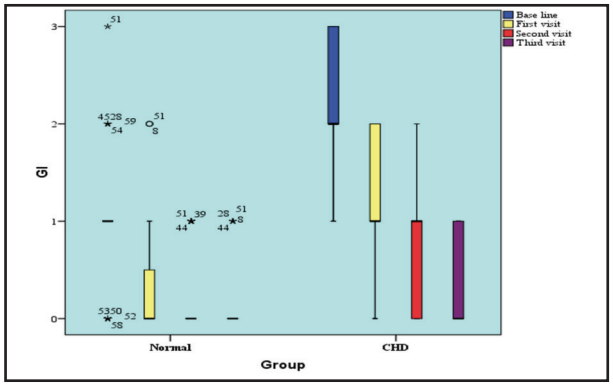

Figure (3) Box plot representing median and range values for GI scores in the two groups (Stars and circles represent outliers)

2. Changes by time within each group

As regards normal group; there was a statistically significant change in median GI score by time (*P*-value <0.001, Effect size = 0.621). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in median GI scores at the first visit. From first to second as well as second to third visits; there was no statistically significant change in median GI score. The median GI score at the third visit showed statistically significantly lower median value compared to base line score.

While in CHD group; there was a statistically significant change in median GI scores by time (*P*-value <0.001, Effect size = 0.858). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in median GI score at the first visit as well as from first to second visits. From second to third visit; there was no statistically significant change in median GI score. The median GI score at the third visit showed statistically significantly lower median value compared to base line score.

Table (4) *Descriptive statistics and results of Friedman's test for comparison between GI scores at different time periods within each group*

Time	Normal (n = 59)		CHD (n = 55)	
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)
Base line	1 (0 – 3) [A]	0.93 (0.64)	2 (1 –3) [A]	2.17 (0.58)
First visit	0 (0 – 2) [B]	0.29 (0.53)	1 (0 –2) [B]	1.19 (0.56)
Second visit	0 (0 – 1) [B]	0.17 (0.38)	1 (0 –2) [C]	0.62 (0.66)
Third visit	0 (0 – 1) [B]	0.07 (0.25)	0 (0 –1) [C]	0.27 (0.45)
***P*-value**	<0.001*		<0.001*	
Effect size (w)	0.621		0.858	

**: Significant at P ≤ 0.05, Different superscripts in the same column are statistically significantly different*

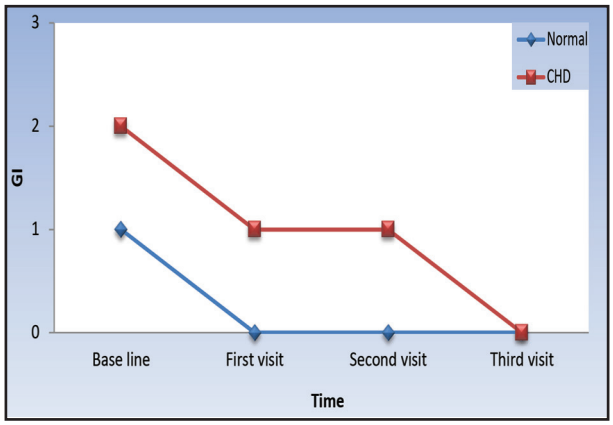

Figure (4) Line chart representing changes in median GI scores by time within each group

D. Oral Hygiene Index (OHI-S)

1. Comparison between the two groups

At base line, first as well as second visits; normal group showed statistically significantly lower median OHI-S scores than CHD group (*P*-value = 0.004, Effect size = 0.552), (*P*-value <0.001, Effect size = 0.783) and (*P*-value <0.001, Effect size = 0.818), respectively.

At third visit, there was no statistically significant difference between median OHI-S scores in the two groups (*P*-value = 0.164, Effect size = 0.328).

Table (5) *Descriptive statistics and results of Mann-Whitney U test for comparison between OHI-S scores in the two groups*

Time	Normal (n = 59)		CHD (n = 55)		*P*-value	*Effect size (d)*
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Base line	0.7 (0 – 2.6)	0.75 (0.66)	1 (0 – 3.3)	1.14 (0.83)	0.004*	0.552
First visit	0.3 (0 – 1.5)	0.39 (0.4)	0.5 (0 – 3)	0.87 (0.82)	<0.001*	0.783
Second visit	0.16 (0 – 1)	0.19 (0.22)	0.3 (0 – 2.6)	0.51 (0.58)	<0.001*	0.818
Third visit	0 (0 – 0.6)	0.12 (0.17)	0.16 (0 – 2)	0.27 (0.45)	0.164	0.328

**: Significant at P ≤ 0.05*

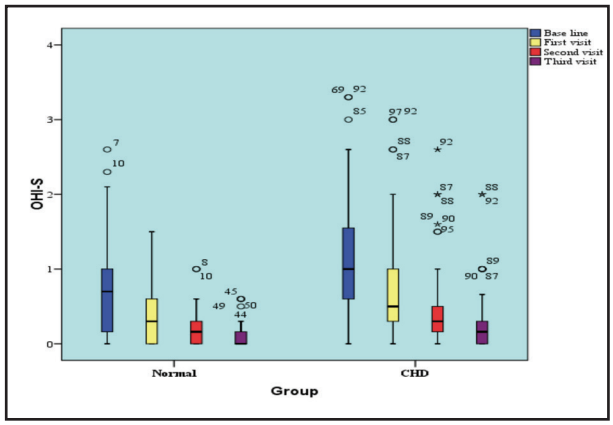

Figure (5) Box plot representing median and range values for OHI-S scores in the two groups (Stars and circles represent outliers)

2. Changes by time within each group

As regards normal group; there was a statistically significant change in median OHI-S score by time (*P*-value <0.001, Effect size = 0.495). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in median OHI-S scores at the first visit as well as from first to second visits. From second to third visit; there was no statistically significant change in median OHI-S score. The median OHI-S score at the third visit showed statistically significantly lower median value compared to base line score.

While in CHD group; there was a statistically significant change in median OHI-S scores by time (*P*-value <0.001, Effect size = 0.853). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in median OHI-S score at the first visit, from first to second as well as second to third visits. The median OHI-S score at the third visit showed statistically significantly lower median value compared to base line score.

Table (6) *Descriptive statistics and results of Friedman's test for comparison between OHI-S scores at different time periods within each group*

Time	Normal (n = 59)		CHD (n = 55)	
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)
Base line	0.7 (0 – 2.6) [A]	0.75 (0.66)	1 (0 – 3.3) [A]	1.14 (0.83)
First visit	0.3 (0 – 1.5) [B]	0.39 (0.4)	0.5 (0 – 3) [B]	0.87 (0.82)
Second visit	0.16 (0 – 1) [C]	0.19 (0.22)	0.3 (0 – 2.6)[C]	0.51 (0.58)
Third visit	0 (0 – 0.6) [C]	0.12 (0.17)	0.16 (0 – 2) [D]	0.27 (0.45)
***P*-value**	<0.001*		<0.001*	
Effect size (w)	0.495		0.853	

**: Significant at P ≤ 0.05, Different superscripts in the same column are statistically significantly different*

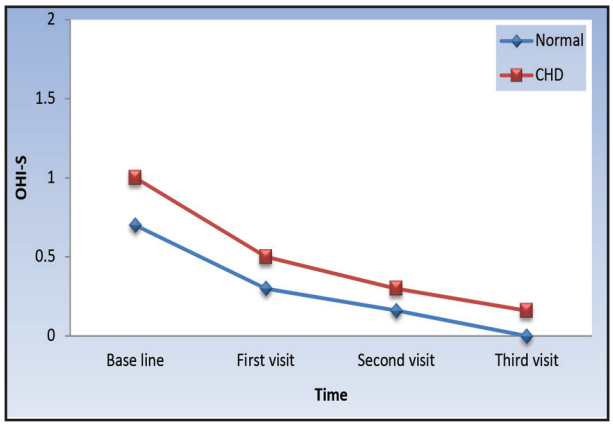

Figure (6) Line chart representing changes in median OHI-S scores by time within each group

DISCUSSION

Congenital heart defect (CHD) children are the most common congenital defect and are described as heart structure abnormalities or major vessels. The defects can be classified as mild, moderate, or serious [16] Feeding, frequent vomiting, malabsorption, and higher energy requirements as a result of increased

respiratory and cardiac effort, may lead even during the night to frequent food [17]. Some cardiac drugs, such as Digoxin pharmaceuticals, demonstrate a substantial link with caries experience, plaque, and gingivitis if available with sucrose-based suspension as Lanoxin® [18].

CHD has many risk factors for oral health [19]. In many cases, oral health is not a priority with all other medical concerns for parents. Parental care focuses on chronic illness and not on oral health [20]. In a study performed in two London; The Group has risk factors for oral health for children with moderate and serious CHD. In comparison with parents of healthy children, the hospitals, dental attitudes, knowledge, and health practices were lower among parents with children with CHD [20].

Preventive oral health programs are not provided to children with CHD, because close monitoring is necessary from an early age.

This study is the first to evaluate an early oral health intervention program in Egypt for children aged between 3 and 6 years. The incidence of caries in children with CHD measured at six years of age did not impair early oral health intervention, according to results from this report [20].

The most straightforward and most common index for epidemiological surveys of tooth decay was found to employ the dmf Index. Dental caries were detected. Depending on the number of carious, missing, and filled teeth, that caries index analyses dental health. For its simplicity and accuracy, the experience of caries is regarded as the most popular measure for caries in all of the world, both current and past [21].

The original OHI-S was described as 'a sensible and simple method of quantitatively evaluating group or individual oral hygiene.' Used by many people since its introduction, the Index has proved to be a valuable tool in dental epidemiology and program evaluation [14].

Systematic evaluation is an important aspect of Community-based oral health initiatives, as it ensures the effectiveness of these community-based interventions. The quality and validity of program assessments are the most common problems in general health promotion schemes raised by effectiveness reviews of oral health interventions. Most of the problems highlighted were the quality of results measures, short periods for evaluating changes, inadequate assessment approaches and an insufficient assessment of the implementation and processes of the program. Integrating community oral health programs into a larger health agenda remains a problem for oral health specialists [20].

Public health research focused on evaluation methodology has revealed a number of difficulties, including the importance of various (quantitative and/or quality) assessment approaches, Limitation of the design for public health assessment of the randomized controlled trial (RCT), the necessity to match evaluation methodologies with the nature of the intervention, and developing results measures suitable for intervention nature, The importance of working capacity in assessment techniques development and the need to develop partnerships between health care professionals and academics in conducting assessments [20].

In the intervention and control groups at least one index tooth was placed. In both unsafe and unadjusted analyses, the chances of dental plaque and gingival bleeding in the intervention group were significantly lower at the age of 6 years than in the control group. In the intervention groups, caries-affected children had more caries teeth than their control group counterparts ($p = 0.76$), although the prevalence of caries among the two groups remained unchanged. The care index of the intervening group was also considerably higher than the control groups, so that fewer children had untreated dental caries in the intervention group.

The present study partly confirms the hypothesis of higher oral problems for children in the

intervention group than for children within the control group.

The relationship between oral and general health is well documented, but it should be considered essential for children with CHD.

No statistically significant difference between mean age values in both groups was shown in the present study. There was no statistically significant gender differential in the two groups.

The result of the present study was reviled to there is not any significant difference between cares index (dmf scores) in the two groups (P-value = 0.760, Effect size = 0056), this agrees with previous study [22].

Although the intervention group's parents were given early information about risk factors for tooth erosion such as vomiting, acidic foods, beverages, and medicines, there was no difference in dental erosion near or into the dentine between the intervention and control groups. Dental erosion can be difficult to prevent, especially in the primary dentition, because children with CHD are more likely to vomit frequently in their first years of life and use acidic drugs [23]. Information alone has no effect on the frequency of vomiting, which is beyond the patient's control, and the drugs prescribed by doctors, acidic or not, will be taken. While the findings of improved oral hygiene in the intervention group are encouraging in terms of future caries development, they may not have the same influence on erosion because plaque is thought to act as a protective factor in erosion development[24].

The previous study discussed that the effectiveness of a 6-year oral health education program for primary schoolchildren. Community dentistry and oral epidemiology [25].

In the present study gingival index was improved in two groups compared to base line GI. In first and second as well as third visits; normal group showed statistically significantly lower GI scores than CHD group.

There was a statistically significant change in GI score over time in the normal group. There was a statistically significant decrease in GI scores during the first visit, according to comparisons between time periods. When compared to the baseline score, the score improved from the first to the second and from the second to the third visit.

While in CHD group; there was a statistically significant change in GI scores by time. In comparisons between time periods revealed that there was a statistically significant decrease in GI score at the first visit as well as from first to second visits and second to third visit compared to base line score. This agreement with previous study that showed the effect of symptom-orientated oral hygiene for children after heart transplantation: Effectiveness of a standardized prophylactic program [26].

In present study, OHI-S scores at base line, first as well as second visits; normal group showed significantly lower OHI-S scores than CHD group.

At third visit, there was no statistically significant difference between OHI-S scores in the two groups (*P*-value = 0.164, Effect size = 0.328).

As regards normal group; there was a statistically significant change in median OHI-S score by time. In comparisons between time periods revealed that there was a significant decrease in OHI-S scores at the first visit as well as from first to second visits. From second to third visit, there was no statistically significant change in median OHI-S score. The median OHI-S score at the third visit showed statistically significantly lower median value compared to base line score.

While in CHD group; there was a statistically significant change in median OHI-S scores by time (*P*-value <0.001, Effect size = 0.853). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in median OHI-S score at the first visit, from first to second as well as second to third visits. The median

OHI-S score at the third visit showed statistically significantly lower median value compared to base line score. This agrees with previous study about Oral health of children with congenital heart disease following preventive treatment [27].

CONCLUSION

The oral health intervention program more effective to improve group of Egyptian children with congenital heart defects compared with healthy Egyptian children group .

ACKNOWLEDGMENTS

We are deeply thankful to Abo-El-Rish hospital, Cairo, for your kind help during this research.

RECOMMENDATIONS

Further study on the effectiveness of an oral health intervention program for group of Egyptian children with congenital heart defects.

Conflict of Interest

The authors declare no conflict of interest.

Funding

The authors declare that they do not have any source of funding.

REFERENCES

1. Pourmoghaddas Z, Meskin M, Sabri M, Norousali Tehrani MH, Najafi T. Dental Caries and Gingival Evaluation in Children with Congenital Heart Disease. Int J Prev Med. 2018;9: 52.
2. Virani SS, Alonso A, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, et al. Heart disease and stroke statistics—2020 update: a report from the American Heart Association. Circulation. 2020;141: 139-596.
3. Francis DK, Smith J, Saljuqi T, Watling RM. Oral protein calorie supplementation for children with chronic disease. Cochrane Database Syst Rev. 2015;5.
4. Karhumaa H, Lämsä E, Vähänikkilä H, Blomqvist M, Pätilä T, Anttonen V. Dental caries and attendance to dental care in Finnish children with operated congenital heart disease. A practice-based follow-up study. Eur Arch Paediatr Dent. 2021; 27:1-7.
5. Ziaeian B, Fonarow GC. Epidemiology and aetiology of heart failure. Nat Rev Cardiol. 2016;13: 368-378.
6. Argent AC, Balachandran R, Vaidyanathan B, Khan A, Kumar RK. Management of undernutrition and failure to thrive in children with congenital heart disease in low-and middle-income countries. Cardiol Young. 2017;27: 22-30.
7. Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta JP, Del Zotti F, et al. ESC guidelines for the management of infective endocarditis: the task force for the management of infective endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). Eur Heart J. 2015; 36:3075–3128.
8. Badran Z, Struillou X, Verner C, Clee T, Rakic M, Martinez MC, Soueidan A. Periodontitis as a risk factor for systemic disease: are microparticles the missing link? Med Hypotheses. 2015;84: 555–556.
9. Koerdt S, Hartz J, Hollatz S, Frohwitter G, Kesting MR, Ewert P, et al. Dental prevention and disease awareness in children with congenital heart disease. Clin Oral Investig. 2018;22: 1487-1493.
10. Baltimore RS, Gewitz M, Baddour LM, Beerman LB, Jackson MA, Lockhart PB, et al. Infective endocarditis in childhood: 2015 update: a scientific statement from the AHA. 2015; 132: 1487-1515.
11. Hagatun S, Vedaa Ø, Harvey AG, Nordgreen T, Smith OR, Pallesen S, et al. Internet-delivered cognitive-behavioral therapy for insomnia and comorbid symptoms. Internet Interv. 2018, 12:11-15.
12. Moreira L, Martins R. presença D. Streptococcus mutans E Interleucina S 6 E 10 EM Amostras de Líquido Amniótico. (2020).
13. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless-steel crowns, and surrounding gingival inflammation in primary molars: Randomized controlled trial. Clin Oral Invest. 2020;24: 3275-3280.
14. Mattos-Vela MA, Carrasco-Loyola MB, Valdivia-Pacheco SG. Prevalencia y severidad de caries dental e higiene bucal en niños y adolescentes de aldeas infantiles, Lima, Perú. Odontoestomatologia. 2017;19: 99-106.

15. Irabor BP, Ola-Obitusin DG, Olufowobi OO. Humanism and Educational reconstructionism in the pedagogy of tai solarin. J Appl Philos. 2020;18.

16. Zimmerman MS, Smith AG, Sable CA, Echko MM, Wilner LB, Olsen HE, Atalay HT, et al. Global, regional, and national burden of congenital heart disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Child Adolesc Health. 2020;4: 185-200.

17. Porges SW, Dana D. Clinical Applications of the Polyvagal Theory: The Emergence of Polyvagal-Informed Therapies (Norton Series on Interpersonal Neurobiology). WW Norton & Company; 2018.

18. Ali HM, Mustafa M, Hasabalrasol S, Elshazali OH, Nasir EF, Ali RW, et al. Presence of plaque, gingivitis and caries in Sudanese children with congenital heart defects. Clin Oral Invest. 2017;21: 1299-1307.

19. Francis DK, Smith J, Saljuqi T, Watling RM. Oral protein calorie supplementation for children with chronic disease. Cochrane Database of Systematic Reviews. 2015(5).

20. Sivertsen TB, Aßmus J, Greve G, Åstrøm AN, Skeie MS. Oral health among children with congenital heart defects in Western Norway. Eur Arch Paediatr Dent. 2016;17: 397-406.

21. Majda E, Saied E, Rogaia A, Rasmia H. Estimate of DMFT index using teeth most affected by dental caries in Benghazi, Libya. IJADS 2020; 6: 159-162.

22. Priya PG, Asokan S, Janani RG, Kandaswamy D. Effectiveness of school dental health education on the oral health status and knowledge of children: A systematic review. Indian J Dent Res. 2019;30: 437.

23. Alexandria AK, Valença AM, Cabral LM, Maia LC. Fluoride varnishes against dental erosion caused by soft drink combined with pediatric liquid medicine. Braz Dent J. 2017;28: 482-488.

24. Joshi M, Joshi N, Kathariya R, Angadi P, Raikar S. Techniques to evaluate dental erosion: a systematic review of literature. J Clin Diagn Res. 2016;10: ZE01.

25. Schulz-Weidner N, Bulski JC, Siahi-Benlarbi R, Bauer J, Logeswaran T, Jux C, Wetzel WE, et al. Symptom-orientated oral hygiene for children after heart transplantation: Effectiveness of a standardized prophylactic program. Pediatr Transplant. 2020;24: 13845.

26. Halawany HS, Al Badr A, Al Sadhan S, Al Balkhi M, Al-Maflehi N, Abraham NB, et al. Effectiveness of oral health education intervention among female primary school children in Riyadh, Saudi Arabia. Saudi Dent J. 2018;3: 190-196.

27. Koerdt S, Hartz J, Hollatz S, Frohwitter G, Kesting MR, Ewert P, et al. Dental prevention and disease awareness in children with congenital heart disease. Clin Oral Invest. 2018;22: 1487-1493.