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ORAL HEALTH OF CHILDREN WITH CARDIAC DISEASE AND THE AWARENESS AND KNOWLEDGE OF THEIR PARENTS

Ronza Azrak[1], Bassam Salman[2], Tehama Youssef[3]

1. Master Student at Department of Pediatric Dentistry- Faculty of Dentistry- Tishreen University, Lattakia, Syria.
2. Assistant Professor at Department of Pediatric Dentistry- Faculty of Dentistry- Tishreen University- Lattakia-Syria.
3. Associate Professor at Department of Gingival and periodontal disease-Faculty of Dentistry-Tishreen University-Lattakia- Syria.

ABSTRACT:

Aim: Children with congenital heart disease (CHD) require special dental care due to the susceptibility of their exposure to infective endocarditis, associated with occurrence of transient bacteremia caused often from invasive dental procedure, so the objective of this study was evaluated oral health status of these children compare to healthy children, and awareness of their parents about importance of good oral health.

Materials and Methods: Oral examination conducted for 50 children have diagnosed heart defect between the ages of 5-12 years who visited the department of paediatric at Al- Assad Hospital / Latakia. Dental caries, plaque, gingivitis were evaluated for each child and a questionnaire was conducted for parents to evaluate level oral health care for their child and their awareness towards the importance of this matter. A control group of 50 healthy children matching the study group by age and gender was examined.

Results: Cardiac children had significantly more caries, plaque and gingivitis ($p<0.05$) than controls. the level of parental knowledge about relationship of oral health with cardiac disease was not satisfactory.

Conclusion: Children with congenital heart disease had poor oral health, and low level of parental awareness. Therefor, this group of patients at increased risk of infective endocarditis

Key words: congenital heart disease, children, oral health, parental knowledge.

INTRODUCTION

The heart is an organ of complex anatomically , its basic function is pumping oxygenated blood to the brain and vital organs. [1] The human heart develops between the 8th and the 12th gestational week. Any disturbance in this process may result in an anomaly congenital heart disease (CHD). [2]

Congenital heart defect may be defined as an anatomic malformation of the heart or great vessels which occurs during intrauterine development, regardless of the age at presentation, [3] and also called congenital cardiovascular defects (CCD). [4] CHD may be classified into acyanotic and cyanotic depending upon whether the patients clinically exhibit cyanosis, [3] and are considered one of the most common congenital anomalies in children, with a mean incidence of approximately 8–10 cases per 1000 live births.[2] The most common form of CCDs is ventricular septal defect (VSD), an opening in the ventricular

*Corresponding Author Address: Dr. Ronza Azrak. E-mail: ronzaazrak88@gmail.com

septum, occurring in 50 percent of all children with congenital heart disease and in 20 percent as an isolated lesion.[5,6] Atrial Septal Defect (ASD) occurs as an isolated anomaly in 5% to 10% of all congenital heart defects. It is more common in females rather than males (male-female ratio 1:2). About 30% to 50% of children with congenital heart defects have an ASD as part of the cardiac defect. [7]

The number of surviving children with heart disease is increasing every year because of the significant progress in diagnostics and treatment. As these children are exposed early to many pharmaceutical and surgical treatments, and the problems of oral health appears especially in severe disease cases such as dental caries and gingivitis and increase in the developmental enamel defects. In addition, to effect of food and medicine intake on a daily basis, and feeling of the parents towards special health status of their child. These factors present a challenge to paediatric dentists, which must provide a safe and effective treatment for these children. [8,9,10]

Children with CHD have poor oral health. This may be largely attributed to cardiac disease, which takes attention and care. So, this may cause underestimated oral health and not be given due importance. In addition, the chronic administration of liquid medicines sweetened with sucrose may increase the incidence of caries and gingivitis to these children. [11,12,13]

Infective endocarditis is a rare but life-threatening microbial infection of the heart valves or endocardium, most often related to congenital or acquired cardiac defects. [14] Many studies have shown significant findings regarding the susceptibility to infective endocarditis and poor oral health, especially periodontal status, and certain dental procedures are risk factors in cardiac patients. [15]

Several attempts were conducted to reduce the risk of the threat of infection endocarditis and established several protocols to prophylactic antibiotics. The most recent guidelines by American Heart Association (AHA) [16] affirm that 'maintaining optimal oral health and practicing daily oral hygiene are more important in reducing the risk of IE than taking preventive antibiotics before a dental visit.

The guidelines by National Institute for Health and Clinical Excellence (NICE) [17], recommend that there is no need for prophylactic antibiotics as a preventive measure in most of the cases where earlier antibiotics were considered compulsory.

Children with heart disease are an important and growing segment of Syrian society and they need special care, in addition the absence of a previous study on this subject in Latakia, so the aim of this study was evaluated the oral health of paediatric patients with congenital heart disease and the parental awareness about their child's

oral health and compare it to age and gender matched health children.

MATERIALS AND METHODS

The sample of the research was collected in a non-random way included 100 children aged between 5-12 years. Study group included 50 children have diagnosed isolated congenital heart defects were attending to paediatric department at Al-Assad Hospital/Latakia, during a four-month period in 2015. Control group included 50 healthy children were attending to paediatric dentistry clinic at Tishreen University, and the two groups were identical age and gender, (case-control) study.

Verbal consent was obtained from the parents after a brief explanation about the oral examination steps required in this research, and exclusion criteria included in both groups:
- Children with severe physical, mental or other serious medical conditions diagnoses such as (genetic disorders, syndromes, neurological disorders ... etc).
- Children under the specific age of study.
- Children who refused to undergo the oral examination required or their parents reject to be part of the study.

Dental oral examination were conducted for each child under normal lighting conditions. Teeth weren't brushed before the examination. But cotton rolls were used to remove the residue of food, if any, or to reduce the moisture, which can prevent the direct vision of the teeth. X-ray photos were not taken. Structured questionnaire was conducted to evaluate the parents information about their child's oral health care. The questionnaire included questions about the activity of brushing teeth, eating snacks and sweetened per day, recall visits to the dentist in the last six months.

Dental caries was conducted using the World Health Organization's (WHO) diagnostic criteria as detailed in the guidelines of Basic Oral Health Surveys (1997). [18]

Simplified Debris Index (DI-S) Green & Vermillion (1964) [19] to evaluate plaque, in primry dentition plaque was evaluated on buccal surface of teeth (51,55,65,71) and on lingual surface of teeth (75,85), and in mixed dentition alternative teeth were chosen in accordance to the selected teeth in index. Modified Gingival Index (MGI) (Lobene et al. 1986) [20] was used to evaluate gingivitis, This index was used because it avoids the periodontal probing of gingival pockets may cause bacteremia of children with CHD and thus there is no need for prophylaxis against infective endocarditis. This index calculated on buccal and lingual surfaces of all teeth in this study.

Statistical analysis: Mann–Whitney U-test was used to compare the average of each of dmft/DMFT, DI-S, MGI between the two groups. Chi-square test and Ficher's exact test were used to analyse and compare the attitudes of

parents according to questionnaire. Differences at ($p \leq 0.05$) were considered statistically significant. Statistical program Stata (version 6.0) was used supervised by an independent specialist analysed the data.

RESULTS:

The study involved 100 children, with an average age was 7.3 years, and the number of males was 31 (62%) and 19 females (38%) in both groups. The Ventricle septal defect (VSD) was the most common cardiac defect (58%) in the study group and the majority of these defects were acyanotic, Figure (1).

The results of this study showed that the prevalence of caries was 92% in the study group compared to 86% in the control group. The prevalence of caries in primary teeth was significantly higher in children with CHD compared to healthy children (98% vs 86%). Mean of all dmft and DI-S and MGI was statistically significantly higher in the study group compared to the controls, whereas there were no significant statistical difference of mean DMFT between both groups. Four (8%) of children in cardiac group were free caries compared to 7 (14%) in the control group, but this difference was not statistically significant, Table (1) and Table (2).

As shown in Table (3) in study group (66%) of children were brushing their teeth without parental help compared to 92% in control group. Ninety percent of cardiac group compared to 58% in control group weren't brushing their teeth daily, and children with CHD were more intake of sweetened food than healthy children ($p=0.07<0.05$), Table (4).

Eating sweetened food twice a day was significantly higher in cardiac group compared to the children in control group (64% vs 46%), Table (5).

Forty-three (86%) patients in the cardiac group had not visited the dentist in the last six months as compared to 42 (84%) in the control group.

In cardiac group forty two percent of parents were aware that their child's oral health may affect the health of his heart, and sixteen (32%) of them had a simple information about infection endocarditis and 34 (68%) had no information about it.

DISCUSSION :

No significant differences were established between mean DMFT of the children with cardiac disease and the closely matched control group, while mean dmft was statistically significant higher in study group compared to control group. This results are in line with the study by Hallet et al [11], Blicks et al [21], and Pollard et al [22] that found a statistically significant higher dmft in 5-9 years old cardiac children as compared to controls. However, a study by Franco et al [23], and Zafar et al [1] didn't found significant differences in the caries index score between the two groups cardiac and healthy children.

The results of this study showed that study group generally had a higher missing component (mt= 0.24 vs 0.10, p=0.09). Balmer et al 2010 [24] also showed similar results, and explained that endodontic treatment of the primary teeth is contraindicated in children who have had heart problems.

We found in our study higher decayed component in cardiac group (dt=4.96 vs 1.96), while higher filling component in control group (ft=0.10 vs 0.84), This result was confirmed by Hallet et al [11] and Balmer et al 2003 [25]. While Franco et al [23] found significantly higher number of decayed permanent teeth in cardiac group compared with controls. The results of studies conducted on the prevalence of caries in children with cardiac disease was contradictory, The consensus is that few medical conditions are associated with an increased caries risk in itself, but because oral hygiene is generally worse in medically compromised children, and their exposure to additional risk factors greater, they are more prone to developing carious lesions, These risk factors may include frequent intake of cariogenic foods and drinks, regular use of sugar-sweetened medicines [26] and poor salivary flow and buffering capacity [27], economic and social factors (The educational level of parents) [28]. Acorrding to the results of this study did not find a statistically significant difference of parental educational level between two groups, and The children in the study group were eating a sweetened food per day more than the controls. The more sugary snacks eaten per day increase the possibility of caries and children with chronic diseases often have frequent sweet meals and candy as sympathy from relatives. Studies have been done on children and adults have shown a positive correlation between the intake of sugars and caries. [29,30]

There are studies indicated that chronic exposure to digoxin is associated greatly with the prevalence of caries in children with cardiac disease. [2,13]

In the present study, the cardiac group generally had higher levels of plaque and gingivitis when compared to control group, and this difference was statistically significant. This results are similar to the study by Nosrati et al.[31] However, a study by Pollard et al [22] and Franco et al [23] didn't found significant difference when compared levels of plaque and gingivitis between cardiac and healthy children. There is no clear reasons to explain these results, but may include the lack of oral health care that provided by the parents of children with chronic diseases. In addition, family stress and the psychological impact of the disease on the child that reduces establishing an adequate oral hygiene habits and this may increase directly and indirectly localized and systemic inflammation [32].

Some children with congenital heart disease take medications containing sucrose and diuretics, that can cause xerostomia, which predispose to gingivitis and periodontal diseases.

Steelman et al [33] were found that cardiac children have specific HACEK microbes (Haemophilus spp, Actinobacillus actinomycetemcomitans spp, Cardiobacterium hominis, Eikenella corrodens and Kingella spp) especially, Eikenella corrodens (E.c.) and Actinobacillus actinomycetemcomitans (A.a.) within the gingival crevice to a greater extent than their normal counterparts.

In response to the question on oral hygiene we found that, the most proportion of children in the cardiac group weren't brushing their teeth daily compared to healthy children (90% vs 58%).This result agreed with study by Franco et al [23] which found only 21% of cardiac children were brushing their teeth regularly compared to 73% of controls. But, study by Zafar et al [1] didn't found significant difference in daily brushing habits between cardiac and controls children.

In this study the parental supervision on brushing teeth was higher in the study group compared to control group, but didn't found significant difference in dental treatments that received by the children during the last six months between the two groups. In contrast to previous results, the study by Nosrati et al[31] found that, the parental supervision on brushing teeth was similar in the two groups, and 90% of children in the two groups didn't received help with oral hygiene procedures, they attributed this results to greater age of the children who participated in this study (mean=10.5±0.4 years), but in our study ages ranged 5-12 (mean=7.3±1.95 years). Also in the study by Nosrati et al differently with our results was the greater proportion of healthy children had received dental treatments compared to cardiac children, Although cardiac children had more recent dental checkups. This result was interpreted that there is reticence not justified in the general dental community toward treating children with congenital cardiovascular defects, and often these children are referred to specialist, this in turn raises the cost of treatment and possibly prevent parents from seeking effective treatment for their child. On the other hand, many studies have indicated that high levels compliance with the periodic visits to the dentist among cardiac children like study by Knirsch et al 2003 [34], Al-sarheed et al [8], and Silva et al [12] , these differences may attributed to the high level of awareness and the free medical services provided in that countries compared to the lack of awareness in the Syrian society about the effect of oral health on general health and low economic level.

The results of this study showed that, in the cardiac group parental knowledge about the term "infective endocarditis", and their child may need antibiotic before undergoing dental treatment was unsatisfactory. This result in line with study by silva et al [12], which found a few of the parents were aware of the term "infective endocarditis". While in study by Cetta et al [35], There was a good parental awareness, 62% of parents

were aware of infective endocarditis and 56% of parents knew that their children need an antibiotic prior to dental treatment carried out. The previous results show that the parents of the study group were mostly unaware of oral hygiene practices. The reason is often indicated in the literature is the lack of recognition of the need for their child's to dental services. A child with heart disease has always given priority by the parents and cardiologist, and as a result are overlooked or neglected oral health care needs which are equally important. [1]

There is a need to focus on educating parents and provide the necessary guidance on the dental care for their children and the importance of complying the checkup visits of the dentist, as the immediate diagnosis and provide treatment for children who have caries can help to improve oral health in cardiac children. This is enhanced by close cooperation between the specialist cardiac doctor and pediatric dentist.

According to the American Academy of Pediatric Dentistry [36], the first visit to each child, there should not be more than six months after the emergence of the first tooth. This should be observed more strongly incases of medically compromised children such as cardiac.

CONCLUSIONS:

Dental caries, gingivitis and plaque were significant higher in the study group. This refers to the poor oral health of children with CHD compared to the closely matched control children. In addition to the lack of parental awareness in cardiac group about the importance of maintaining good oral health for their child, and seriousness of suffering of infective endocarditis.

There is a need to raise awareness about Preventive health care and dental procedures.

It is useful to conduct long-term studies to verify the relationship between heart disease and periodontal disease and the effect of cardiac medications on oral health.

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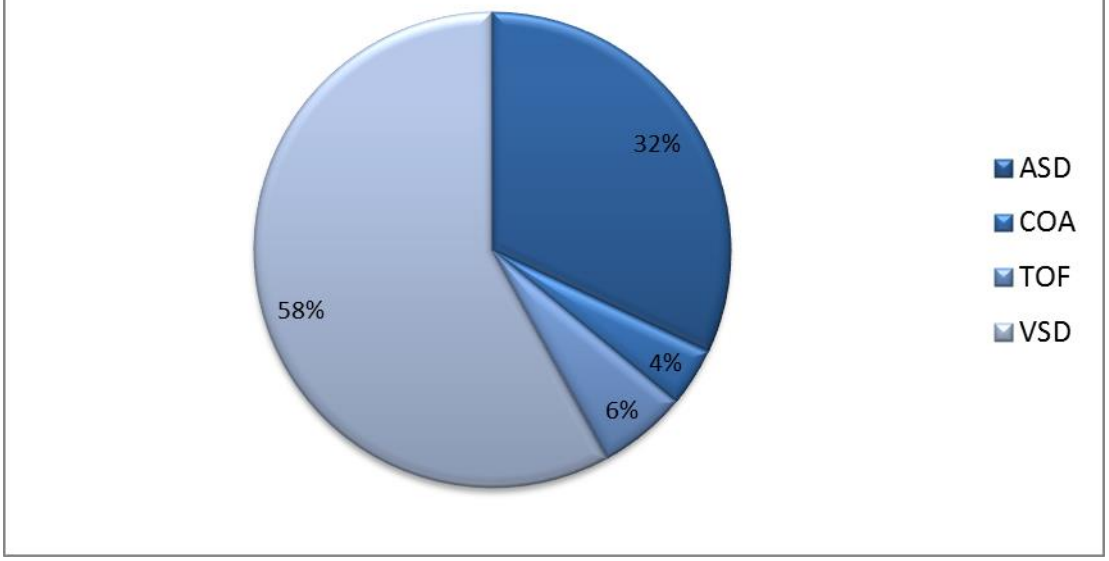
FIGURES:



ASD: Atrial septal defect, COA: Coarctation of the aorta, TOF: Tetralogy of Fallot , VSD: Ventricle septal defect

Figure (1) Frequency of different types of congenital heart defects in cardiac group

TABLES:

Table (1) Dental caries in cardiac and control groups

Dental caries	Cardiac group	Control group	P value
dmft	5.30±2.24	2.84±2.12	0.0001
dt	4.96±2.25	1.96±2.10	0.0001
mt	0.24±0.52	0.10±0.36	0.09
ft	0.10±0.30	0.84±1.18	0.0001
DMFT	0.70±1.05	0.58±0.95	0.59
DT	0.68±1.02	0.52±0.95	0.31
MT	0.00±0.00	0.00±0.00	-
FT	0.02±0.14	0.06±0.24	0.31

Table (2) Plaque and Gingivitis in cardiac and control groups

Index	Cardiac group	Control group	P value
DI-S	0.73±0.38	0.56±0.30	0.0036
MGI	0.37±0.52	0.04±0.15	0.0002

Table (3) Parental answers to the questions related with oral hygiene of the child in cardiac and control groups

Question and answer options	Cardiac group	Control group	P value
Who brushes your childs' teeth?			
Child	33(66%)	46(92%)	0.004
Parent	4(8%)	2(4%)	
Both	13(26%)	2(4%)	

Table (4) Parental answers to the questions related with oral hygiene of the child in cardiac and control groups

Question and answer options	Cardiac group	Control group	P value
Tooth brushing frequency a day			
One a day	5(10%)	20(40%)	0.001
Twice a day	0	1(2%)	
More than twice	0	0	
Dosent' brushing every day	45(90%)	29(58%)	

Table (5) Eating sweetened food in cardiac and control groups

Question and answer options	Cardiac group	Control group	P value
Sugary snacks eating frequency a day			
One a day	12(24%)	23(46%)	0.07
Twice a day	32(64%)	23(46%)	
More than twice	6(12%)	4(8%)	
Dosent' eating every day	0	0	