Oral Health Of Children With Congenital Heart Disease In Comparison With Their Healthy Siblings And Knowledge And Attitude Of Their Parents

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DEDICATION

To my parent, my brothers, to all children with congenital heart disease and their families in my country, I dedicate this thesis.

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LIST OF ABBREVIATIONS

ABBREVIATION	FULLTERM
CHD	Congenital heart disease.
IE	Infective endocarditis.
DMF	Decayed, missed, filled, permanent teeth.
WHO	World health organization.
dmf	Decayed, missed, filled primary teeth
BEP	Bacterial endocarditis prophylaxis.
USA	United state of America.
AP	Antibiotic prophylaxis.
BSAC	British society of antimicrobial chemotherapy.
UK	United kingdom.
NICE	National institute of clinical care and excellence.
ESC	European society of cardiology.
AHA	American heart association.
MVP	Mitral valve prolapse.
IV	Infective endocarditis.
BMC	Benghazi medical center.
BCC	Benghazi cardiac center.
OHI-S	Oral hygiene index-simplified.
DDE	Developmental defects of enamel.

DEO	Demarcated opacities.
DIO	Diffuse opacities.
EH	Enamel hypoplasia.
OHB	Oral health behaviors.
IM	Integrative models.

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ABSTRACT

Background: Congenital heart defects (CHDs) are congenital problems that occurring in the heart or its great blood vessels. Some studies found the oral health among children with CHD same as in healthy children, the majority of studies revealed that CHD children have poorer oral health than healthy children.

Aim: the aim of this cross sectional comparative study, assessment of oral health status and treatment needs among Libyan children diagnosed with CHD.

Materials And Methods: total of 162 children were participated in the study, divided equally into two groups, eighty one children in each group, the first group contain children with CHD, the second group contain their healthy siblings. Caries experience was assessed by using dmft, DMFT indices, oral hygiene assessed by OHI-S, and assessment of developmental dental defects, comparison done between the tow groups. The parents were asked about the oral health practice for their children, the knowledge about the oral health and its relation to cardiac health.

Result: the result of the present study shows generally children CHD have higher numbers of decayed, teeth in both primary and permanent dentition, however, the only statically significant differences was observed in primary dentition. Regarding to OHI-S there was significant difference between the two groups. In dental anomalies there was significant difference between the two groups. Regarding to teeth brushing, no significant difference between the two groups. Regarding to parent's knowledge the parents have poor knowledge about the oral health importance and its relation to cardiac health, and the need for antibiotic prophylaxis before dental treatment.

Conclusion: this study shows that, children with congenital heart disease have poorer oral health, higher number of decayed, teeth and more dental anomalies in comparison with their healthy siblings. However, both groups generally having poor oral health. Parental knowledge was poor and there was a lack of appropriate oral health behaviors.

Key words: congenital heart disease, oral health, decayed, missing filled indices, plaque, Dental anomalies, infective endocarditis, knowledge, attitude, guidelines.

CHAPTER ONE

INTRODUCTION

1. INTRODUCTION

Congenital heart defects (CHDs) are congenital problems that occur during the embryonic development of the heart or its great blood vessels, resulting in abnormality in their structure, and hence functional impairment of the heart and blood circulation (1). CHDs are categorized according to the severity of the defect into mild, moderate, or severe (2). They are very common accounting for 28% of all major human congenital defects, with a global incidence that is estimated to be eight per 1000 of the population (3).

Children with CHD are a special care group because of their underlying medical condition, which can influence any health care provided to them, including oral health care. This later is of special interest because it can have significant negative impacts on the general health of CDHs children (4). For instance, odontogenic bacteremia can result in life- threatening conditions such as infective endocarditis (IE) and brain abscesses (5). Infective endocarditis of oral origin has conventionally been thought to be associated only with invasive dental procedures, through the entry of oral bacteria into the systemic circulation (for example, *Streptococcus viridans*, *S. sanguinus*, and *S.mutans*) (6). However, recent studies have shown that bacteremia can be associated with routine daily activities such as chewing, flossing, and tooth brushing (7). Therefore, maintaining optimum oral hygiene is very important for oral health of children with CHD, as well as their general health, since it could prevent any unfavorable consequences (8).

Parents, especially mothers, play a key role in maintaining optimum oral hygiene and good dental health of their children by acting as role models for

their children (9). Thus, parent's knowledge and attitude are of paramount importance for shaping their health behaviors and consequently the oral health behaviors of their children as well as children's oral health in their early years of life (10-12).

With the growing concerns about the oral problems related to CHDs, several studies in different countries have compared oral conditions of children with CHDs to that of those without CHDs. In some of these studies, the prevalence of caries and gingivitis among children with CHDs was much higher than in their counterparts (8, 13-17), other studies show same oral health for CHDs children and healthy children (18,19). However, it is generally accepted that children with cardiac problems have poorer oral health than healthy counterparts. This can be attributed to several reasons such as malnutrition and growth retardation, frequently with extra meals to compensate even during night, continuing intake of sugared medicines, such as sucrose–based suspension of digoxin (8,19). Increased tooth susceptibility from developing enamel defects, since ameloblasts are highly sensitive to changes in metabolic conditions (20). Further more enamel defects with rough, pitted, or exposed dentine surfaces increase the susceptibility for caries (21).

Developing effective prevention strategies and programs to promote the oral health of such special group requires the contextual knowledge of oral health needs and related determinants. Therefore, studying the oral health status and treatment needs in their context become a necessity in the light of the aforementioned controversy in the findings of different studies in different countries. As far, as author knows, there is no study in Libya compare oral health of children with CHD with healthy children, to fill this gap, the current study aims to assess oral health status of CDH children in

Benghazi and compare them with their healthy siblings, and to assess their parents knowledge and attitude towards oral health.

CHAPTER TWO

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1. Introduction

As mentioned in the introduction section, different studies have been conducted about dental caries, periodontal conditions, salivary bacterial counts and types in children with CHD, their parent's knowledge and attitude about oral health and its relation and effects on cardiac health of their children. In this section, a review of main findings of studies on children with CHD and oral health and related issues is presented.

2.2. Oral health

2.2.1. Dental caries

Dental caries is multifactorial disease caused by interaction between dietary carbohydrates and oral bacteria, resulting in acid formation and demineralization of dental hard tissues the manifestations of this disease range from color changes in dental enamel to frank cavity formation (22). Caries prevalence and severity are usually measured using Decayed, Missing and Filled (DMF) indices according to World Health organization criteria (23).

Reviewing literature, some studies found differences in numbers of decayed, missed, and filled indices among CHD children when compared with that of healthy children in primary dentation (dmf) and in permanent dentition (DMF). Australian study compared oral health status of 39 CHD children with that of 33 healthy siblings, found higher caries severity and

prevalence in primary teeth of CHD children although no differences were reported when comparisons made for permanent dentition (16). Likewise, another study performed in Sweden by Blicks et al., in 2004 found huge difference in dmf scores among CHD children (5.2, sd= 7.0) compared to (2.2, sd=3.5) in control group (8). Other studies conducted in Middle Eastern countries such as Turkey and Sudan reported significantly higher numbers of decayed teeth in both primary and permanent teeth in CHD children (13,14). However, another study conducted in turkey 2015 by Cantekin et al., showed no significant difference between both groups (18).

The higher caries prevalence and severity among CHD children has been attributed to many factors. For example, lower salivary PH buffering capacity in children with CHD (24). Differences in the ultrastructure and composition of enamel and dentin, which account for their ability to resist the effects of cariogenic bacteria and other destructive factors in the oral environment. Several disease related factors may be involved in producing these changes includes: hemodynamic alterations, malnutrition, infective endocarditis, medications (25). However, dental caries is behavioral disease that can be prevented by maintaining optimum oral hygiene and dietary habits (26). Some researchers found that cariogenic microorganisms grow more in oral cavity of CHD children than healthy children as conducted by Ajammi et el., in 2015, where the hypoxia was an additional promoting factor (27). What is more difference in microorganisms (MO) can be due to more carbohydrate in dietary intake among CHD children as a consequence of parental indulgence of these children, where changes in dietary intake lead to changes in MOs in oral cavity (28).

2.2.2. Dental Anomalies:

Different studies have been conducted about dental anomalies in CHD children. Some of these studies found significant differences in the prevalence of dental anomalies among CHD children when compared with healthy children. For instance, a study conducted in the year 1992 in prince Charles hospital in Australia reported that dental anomalies were more than two-folds higher in CHD than that in healthy controls (16). A more recent study found that erosion and developmental enamel defects and post eruptive breakdown of enamel and exposure into dentine to be higher in children with CHD (29). Other abnormalities have been detected in CHD children such as cyanosis, pale tissues, cleft lip (30) and delay in bone age (13). However, other study found no significant differences, Tasioula and colleagues in 2008 reported enamel defects in 8 out of 86 CHD children, which is comparable to what was found in the healthy controls 5 out of 60 (31).

2.2.3. Oral Hygiene and Periodontal health status:

Different studies about periodontal condition in children with CHD revealed that children with CHD have poorer oral hygiene, more debris, plaque deposition and periodontal health than healthy children (14-17). CHD children were found to have poorer oral hygiene with more tongue coating 50.6%, plaque 41.8%, calculus35.3%than their healthy counterparts (15). Another study found higher scores of simplified oral hygiene index (17), more plaque deposition and more gingivitis than healthy children among CHD children (14). However, other studies did not find any significant differences when oral hygiene and periodontal health status were compared between CHD and healthy children (18,32). Healthy children

brushed their teeth significantly more often (65.4%) than the CHD children (45.1%), CHD children 23.1% in comparison to 8.1% of the controls had never visited a dentist before (33). Effective treatment of periodontal infections is important to reduce local inflammation and bacteremia. In addition, a study in Italy by Carinci et al., 2018 reported that, poor periodontal health appears to increase the risk of cardiovascular disease, pulmonary disease, and preterm and low birth weight (34).

2.3. Knowledge and attitude:

One of the barriers to prevention of dental disease for people with special needs is the informational barrier including lack of understanding about effective practices to prevent dental disease. It is critical that the individual and his or her parent and caregiver understand the techniques for prevention of dental disease. Different studies about the knowledge and attitude of parents for children with CHD found that, parental knowledge was not satisfactory with regards to the importance of the maintenance of good oral health for the prevention of infective endocarditis (10,15,35-37). In 2002 in Brazil Silva D.B et al., in their study in parent's of 170 children with CHD their ages between 2-17 years old, they found the percentage of guardians who understood the meaning of heart infection was 9.6%, who knew the possibility of heart disease caused by dental procedures was 60.6%, who understood the requirement of antibiotic cover before dental treatment was 72.1% and who understood the importance of good oral health to prevent infective endocarditis was 41.3% (38). Likewise, in India, Suvarna et al., 2011 in their study in 105 parents for children with CHD, in questioner about their knowledge and attitude, their result was, 57 of 105 (67%) aware that poor oral health is not good for the heart, 17(20%) did not aware, and 6

(7.1%) does not matter at all. When they asked whether poor oral health jeopardized the health of the heart, 67% replied positively, 20% did not comply, and 7% said it doesn't matter at all (10). In Iran Ghajari et al., 2014 reported in their case control study in 25 children with CHD, aged 2-16 years old, low level of knowledge of parents of children with CHD, 60% of them stated that, correlation exists between cardiac disease and oral and dental health, the majority of parents believed that, cardiac patients need more attention during dental procedure, 56% only aware the need of antibiotic prophylaxis before dental treatment (39). In Germany Koerdt et al. 2017, in their study in 150 parents of children with CHD, show an absence of information in parents concerning preventive measures and oral hygiene. Knowledge of the indications for antibiotic prophylaxis and for actually given medications was lacking. Preventive dental measures were not performed according to current guidelines (40). In 2004 in Kingdom of Saudi Arabia, King Khaled University Hospital, a study was conducted by Al-Jarallah et al., to determine the parental knowledge of bacterial endocarditis prophylaxis (BEP). They concluded that while most parents know the nature of their child′s heart lesion and current medication, parental knowledge of endocarditis and its prophylaxis was limited. The study suggested intensified education programs in order to prevent potential major morbidity and mortality for pediatric patient with CHD (41).

In Sudan in 2015 the majority of the parents (64%) were found to have poor knowledge about (CHD). While only (36%) of the parent were found to have good knowledge. This reflects the insufficient knowledge and inadequate information attained by the parents. This could be explained by the inadequate current setup of the cardiac clinic. All the procedures such as clinical examination, (ECHO) and the parents' education, both medical and

nutritional were offered by a single pediatric cardiologist. Supporting staff like dietitian, social worker or specially trained nurse were not readily available in the clinic (42).

2.4. Infective endocarditis:

2.4.1.Overview of Infective Endocarditis

Infective endocarditis (IE) is devastating disease with high Morbidity and mortality. IE is an infection of the heart's internal surface (endocardium) including the heart valves (43). Lewis and Grant first suggested the concept that bacteria released into the circulation during invasive dental procedures might cause IE in 1923(44), and confirmed in 1935 by Okell and Elliott (45). Who demonstrated that 61% of patients following dental extraction had a positive blood culture for oral viridans group Streptococci and that oral viridans group Streptococci could be isolated from the vegetation of 40–45% of IE cases (45).

The incidence of infective endocarditis is rising. There are approximately 2,150 cases of infective endocarditis in the UK annually. 15-20% of infective endocarditis patients die during their initial hospital admission, further 10-15% die over the following year. 35-45% of cases are caused by oral *viridance* group *streptococci*, similar proportion are caused by skin related *staphylococc*i (46). Approximately, 40-45% require surgery during the initial hospital admission, often involving prosthetic replacement of one or more heart valves, and further 10% need surgery in the year after discharge, many survivors will have significantly reduced quality and length of life. Presentation can be subtle with, malaise, weight loss, and fever being the most common presenting symptoms (46).

2.4.2. Oral Hygiene and Infective Endocarditis:

Maintenance of good oral hygiene and regular dental follow up is considered to be important in prevention of IE (28,47). In a longitudinal study in Taiwan, where the sample was collected, treated and follow up for 9 years they found that, improvement of oral hygiene by dental scaling may reduce the risk of IE (48). However, oral hygiene habits such as brushing using tooth picks, flossing or chewing can result in bacteremia during non exposure periods the micro trauma caused by this daily activities induce bacteremia in similar proportions to those of invasive oral procedures for which Antibiotic prophylaxis (AP) is recommended. The fact that the cumulative non-exposure periods are much longer than the exposure periods strongly suggests that most cases of IE are due to everyday life bacteremia (49). Different studies revealed that everyday activities such as tooth brushing, dental flossing and chewing also release bacteria into the blood stream (28, 47, 50).

Although the frequency of bacteremia is less than after dental extraction and the duration less, suggesting that the magnitude of bacteremia is also less. The frequency and magnitude of bacteremia caused by daily activities is also likely to be influenced by the state of oral hygiene and presence of periodontal disease. Indeed, individuals with markers of poor oral hygiene are 4-8 times more likely to develop a bacteremia with organisms that can cause IE following tooth brushing than those with better standards of oral hygiene (7). In randomized control trials study about the incidence, duration, nature, and magnitude of endocarditis related bacteremia from dental extraction and tooth brushing by Lockhart et al., 2008 in Carolina medical center USA found that, although amoxicillin has significant impact on bacteremia resulting from single tooth extraction given the greater frequency

for oral hygiene, tooth brushing may be greater threat for individuals at risk for IE (47). Another randomized controlled trial, in Carolina medical center, found that, individuals with mean plaque and calculus scores of 2 or greater were at 3.78-4.43 fold-increased risk of developing bacteremia, respectively. Bacteremia after tooth brushing is associated with poor oral hygiene and gingival bleeding after tooth brushing (7). Meta-analysis of clinical trials showed that, plaque accumulation and gingival inflammation scores significantly increased the prevalence of bacteremia following tooth brushing (50).

Another randomized control trial by Mougeot et al, in 2015 in Carolina medical center, where 98 bacterial species in blood following single tooth extraction and tooth brushing with and without antibiotic prophylaxis, the conclusion of this study was, although antibiotic prophylaxis significantly decreased the incidence of bacteremia, the similarity between the incidence of bacteremia following brushing and extraction undermines antibiotic prophylaxis as an effective strategy for the prevention of these distant site infections (28).

So maintenance of optimal oral health and oral hygiene is more important than AP in prevention of endocarditis (35-37). Studies resulted that 14-20% of IE cases due to oral hygiene (36). Oral hygiene habits such as brushing, flossing, toothpicks, and, chewing, can result in bacteremia in non-exposure periods, the micro-trauma caused by these activities lead to bacteremia in similar proportion. In 2009 Lockhart P B et al, found that children with poor oral hygiene are 4-8 times more likely to develop bacteremia with organisms that can cause infective endocarditis following teeth brushing than those with better standard oral hygiene (7).

The ESC guidelines have been recommended that, AP is limited to high risk patients with high risk dental procedure, in addition they emphasis that, good oral hygiene and regular dental follow up are more important than AP in reducing IE risk they recommended dental follow up should be performed at least twice a year in high risk and once a year in moderate risk patient for IE (51).

2.4.3.Oral bacteria and IE

The link between IE and oral bacteria has been known for many decades and has caused ongoing concern for dentists, patients and cardiologists (46). The microbiota of the mouth is extremely diverse and more than 700 bacterial species have been detected (52). Half of them are uncultivable so far. Oral microbiota is not uniform, specific sites exist in the mouth such as tongue, palate, cheek, teeth and periodontal pockets that have their own microbiota (53). Factors involved in the development of a bacterial endocarditis are difficult to define but a vulnerable surface (i.e. damaged endocardium) and a high bacterial load in the blood seems to be decisive (54).

However, *staphylococcus, streptococcus* and *enterococcus* have been identified as the causative microorganisms in 90% of cases, this includes oral *streptococci*, which belong to *viridans* group (*streptococcus mutans* and *streptococcus sanguis*) (54). As they are part of dental plaque, they could enter the blood stream causing bacteremia through daily habits like chewing or tooth brushing (50).

2.5. Antibiotic prophylaxis

2.5.1. Historical background:

In the late 1800s Wyssokowitsch et al., established that bacteria entering the circulation could colonize damaged heart valves (55). In 1885 in the Royal College of Physicians of London, Osler identified the importance of fibrin and platelet deposition on damaged endocardium and the primary role of microorganisms in pathogenesis (56).

In 1923 Lewis and Grant suggested that bacteria released into the circulation during invasive dental procedures might cause IE (44). And confirmed by Okell and Elliott in 1935, who demonstrated that 61% of patients following dental extraction had positive blood culture for *viridans* group *streptococci* and that oral *viridans* group *streptococci* could be isolated from the vegetation of 40-45% of IE cases (45).

In 1940, a hypothesis had been published which implicated oropharyngeal sepsis as the cause of many systemic diseases leading to the systematic removal of teeth and other tissues in an attempt to prevent conditions such as IE. Following a critical appraisal of the focal infection hypothesis by Reinmann and Havens (57).

In 1955 The first AHA guidelines identified those patients with rheumatic or congenital heart disease as being at increased risk of IE, and "dental extraction and other dental manipulations which disturb the gums, the removal of tonsils and adenoids, the delivery of pregnant women, and operations on the gastrointestinal or urinary tracts" as procedures where AP was indicated. They recommended intramuscular penicillin (600,000 units of

aqueous penicillin or 500,000 units of procaine penicillin in oil containing 2% aluminium monostearate) 30min before dental procedures. An alternative, but less desirable, oral penicillin regimen was also described (250,000–500,000 units "one-half hour before each meal and at bedtime, beginning twenty-four hours prior to the operation and continuing for 5 days", an extra dose of 250,000 units being desirable at the time of the procedure) (58).

In 1975 the AHA guidelines recommended that these patients receive an AP regimen consisting of intramuscular streptomycin (1g) plus intramuscular penicillin (1,000,000 units of aqueous penicillin G or 600,000 units of procaine penicillin G), whilst other at-risk patients were recommended to expose to intramuscular penicillin alone or in combination with streptomycin. Importantly, the possibility that bacteraemia with oral organisms could occur in the absence of dental procedures and the consequent need to "maintain the highest level of oral health" were recognised for the first time. In 1982 the British society of antimicrobial chemotherapy (BSAC) produced the first UK guidelines, they recommend single 3G oral dose of amoxicillin 1 hour before the procedure (59).

2.5.2. Guidelines:

According to National Institute for health and Care Excellence (NICE) guidelines in 2008 in UK: Antibiotic prophylaxis against infective endocarditis is not recommended for people undergoing dental procedures' (or other non-dental procedures) (46).

Dayer and colleagues, 2015 found a very significant 88% fall in antibiotic prophylaxis prescribing in the 5 years following the NICE guidelines, and a

significant increase in the incidence of IE. However, By March 2013 there were an extra 419 IE cases per year than expected. These data raised the possibility that the NICE guidance was causing an increase in the number of IE cases and led NICE to announce a review of its guidance. At the same time the European Society of Cardiology (ESC) by its panel which consist of 40 clinicians from cross Europe, who produce antibiotic prophylaxis guidance for the whole of Europe, scheduled a review of its guidance, and the American Heart Association by its committee, who produce similar guidance for North America, also announced a review. Although they have decided to wait the outcome of the NICE and ESC review before starting (46).

The NICE guideline has now been changed to 'Antibiotic prophylaxis against infective endocarditis is not recommended routinely for people undergoing dental procedures'.

According to NICE guidelines: describes the risks and ways in which it can be reduced (including antibiotic prophylaxis), and then allow them to decide for themselves if they want antibiotic prophylaxis or not (60). The ESC guidelines recommend that antibiotic prophylaxis is limited to patients at highest risk of infective endocarditis undergoing highest risk dental procedure, which closely matches AHA guidelines (46). The ESC does not currently recommend antibiotic prophylaxis for those at moderate risk; however, it does highlight the importance of good oral hygiene and oral care with at least annual dental review for these individuals (46).

Others recommended AP for moderate and high-risk patients. Patients considered to be at high risk if they have previous IE or a prosthetic valve, and considered to be at moderate risk if they have medical problems such as

acquired valve disease or hypertrophic cardiomyopathy as recommended by Japanese circulation society(61). Other opinions suggest that antibiotic prophylaxis is no longer recommended, solely, for those at risk of IE undergoing invasive procedure, but when it is given for other reasons during procedure, the antibiotics should cover the common IE organisms (62).

Tables 1,2,3 summarize different risk levels and recommended prophylaxis.

Table 1: Risk procedures and patient risk classification according to American Heart Association (AHA) 2007:

Prophylaxis required for those	**Those at highest risk of an adverse outcome from IE**
High risk patients	1- Prosthetic cardiac valve or prosthetic material used for valve repair. 2- Previous IE. 3- Unrepaired cyanotic CHD, including palliative shunts and conduits. 4- Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or catheter intervention during the first 6 months after the procedure. 5- Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch. 6- Cardiac transplantation recipients who develop valvulopathy.
Moderate risk patients	
High risk procedures	1-All dental procedures that involve manipulation of the gingival tissue or the periapical region of teeth or perforation of the oral mucosa. 2- procedure on respiratory tract or infected skin, skin structures or musculoskeletal tissue.

Table 2: Risk procedures and patient risk classification according to European Society of Cardiology (ESC) 2015:

Prophylaxis require for those	**Those at highest risk of IE undergoing a high-risk procedure**
High risk patients	1 Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair. 2 Patients with a previous episode of IE. 3 Any type of cyanotic CHD. 4 Any type of CHD repaired with a prosthetic material, whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains after the procedure.
Moderate risk patients	1-Patients with a previous history of rheumatic fever. 2- Patients with any other form of native valve disease (including: bicuspid aortic valve, MVP and calcific aortic stenosis). 3-Patients with unrepaired congenital anomalies of the heart valves.
High risk procedure	Antibiotic prophylaxis should only be considered for dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa.

Table 3: Risk procedures and patients risk classification according to National Institute for health and Care Excellence (NICE) 2016:

Prophylaxis required for those	**Antibiotic prophylaxis against IE is not recommended routinely for people undergoing dental or other procedures (routinely added 2016)**
High risk patients	1- Acquired valvular heart disease with stenosis or regurgitation. 2- Valve replacement. 3- Structural congenital heart disease, including surgically corrected or palliated structural conditions, but excluding isolated atrial septal defect, fully repaired ventricular septal defect or fully repaired patent ductus arteriosus, and closure devices that are judged to be endothelialised. 4- Previous infective endocarditis. 5- Hypertrophic cardiomyopathy.
Moderate risk Patients	
High risk procedures	Advice not given.

2.5.3.Doses of antibiotic prophylaxis:

According to ESC guidelines for the management of infective endocarditis, and recommended by AHA and NICE.

Table 4: Doses of antibiotic prophylaxis

Situation	Antibiotic	Adult	Children
No allergy to penicillin or Ampicillin	Amoxicillin or Ampicillin	2G orally or intra venous (IV).	50mg/kg orally or IV.
Allergy to Penicillin or Ampicillin	Clindamycin	600 mg orally or IV.	20mg/kg orally or IV.

*Single dose 30-60 minutes before the procedure.

CHAPTER THREE

AIMS AND OBJECTIVES

3.AIMS AND OBJECTIVES

Aims

To assess oral health status and treatment needs among Libyan children diagnosed with CHD.

Objectives:

1. To compare dental caries experience among CHD children with that of healthy controls using dmf indices.

2. To compare oral hygiene and its maintenance practices of CHD children with that of healthy controls.

3. To compare the distribution of developmental defects among CHD children with that of healthy controls.

4. To assess oral health related knowledge and attitude among parents/guardians of CHD children.

CHAPTER FOUR

MATERIALS AND METHODS

4.Material and Methods

4.1.Study design:

The study was cross sectional comparative study among group of children with congenital heart disease (case) group, and their healthy siblings (control) group. The cases were collected from the cardiology departments in the three main hospitals in the city of Benghazi (Pediatrics hospital, Benghazi Medical Center (BMC), and Benghazi Cardiac Center (BCC). Permissions to conduct the study and collect data were taken from local authorities and responsible staff in the study sites.

4.2. Sampling and recruitment:

A convenience sample of children with congenital heart disease was invited to take part in the study. A similar number of healthy siblings were included in the control group. A total of 162 children divided equally into two groups (81 each group) were included in the study. This sample size was found to be sufficient to estimate size difference between two means.

- Inclusion criteria:

1- Children aged between 3-12 years old.

2- Medically free from any other disease or syndrome.

3- Did not subjected to any open-heart surgery during the last 6 months.

4- Not critically ill and his/her medical condition suitable for examination.

5- Has healthy sibling without any medical problem, and if possible closest in age and matched gender.

- Exclusion criteria:

1- The critically ill children.

2- Children who don’t have siblings or healthy siblings.

3- Having any other disease or syndrome.

4.3.Dental examinations:

The data collected in period from November 2018 until October 2019, by working in 5 days a week during regular working hours. (8:00 am-2:00 pm). The examinations were conducted by single trained and calibrated examiner. Examinations of the cases were taken in the hospital in the same room of echocardiogram by disposable instrument, (disposable mirror and periodontal probe) in daylight. In dental clinic the patients had given antibiotic prophylaxis if they were needed. The antibiotic prophylaxis given according to the child body weight, according to ESC, AHA and NICE guidelines, the equation was 50mg \kg of amoxicillin (63). The examination done in dental chair, by sterile mirror and periodontal probe, oral hygiene instruction and information about the oral health and its relation to cardiac health were given to the parent, the patients given the required treatment. Caries experience was assessed by using decayed, missed, and filled primary and permanent teeth (DMF)(dmf), following the WHO criteria and scoring

system: caries was registered as lesion in the pits and fissures, in a smooth tooth surface, undermined enamel or detectable softened floor or wall, destroyed crown, temporary fillings, and permanent fillings with secondary caries (44). The oral hygiene assessed by Oral Hygiene Index-Simplified (OHI-S). Teeth were examined for debris and calculus was permanent upper right central incisor, and first molar, upper left first molar, lower left central incisor and first molar, lower right first molar. In primary dentition teeth examined were Primary Upper right central incisor, second molar, upper left second molar, lower left central incisor and second molar, lower right second molar (14,16,44).

Table 5: Criteria for classifying debris:

Score	Criteria
0	No debris or stain present.
1	Soft debris covering not more than one third of the tooth surface.
2	Soft debris covering more than one third but not more than tow third of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.

Table 6: Criteria for classifying calculus:

Score	Criteria
0	No calculus present
1	Supragingival calculus covering not more than one third of the exposed tooth surface.
2	Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than two third of the exposed tooth surface or continuous heavy band of subgingival calculus around the cervical portion of the tooth or both

The entire oral cavity was also examined for the presence of any ulceration, trauma, abnormal discoloration, discharging sinuses, swelling, hypoplastic teeth, congenitally missing teeth, pig shaped incisor, Gemenation or fusion, geographic tongue, tongue tie or any soft / hard tissue lesions or changes.

Table 7: Criteria for classifying developmental defects of enamel:(64)

Basic type of DDE	Subtype of DDE
Demarcated opacities (DEO)	Demarcated opacities (white\cream). Demarcated opacities (yellow\brown)
Diffuse opacities (DIO)	Diffuse opacities lines\patchy Diffuse opacities confluent Confluent patchy stain gloss of enamel
Hypoplasia (EH)	Hypoplasia pits Hypoplasia missing enamel
Discoloration	

4.4. Knowledge and attitude

Parents were asked to complete a structured questionnaire interview about their knowledge about oral health, the importance of oral health in relation to cardiac health, and their knowledge about infective endocarditis. The questionnaire also included questions on the frequency of teeth brushing for their children both healthy child and child with congenital heart disease (CHD), brushing at bedtime, previous dental treatment for both of them (child with congenital heart disease and healthy sibling).

4.5 .Questionnaire development and administration:

The questionnaire was developed from previous studies (8,15,16,43), and piloted for clarity, relevance, and understandability among sample of parents attending pediatric dental clinics. The interviews were carried out in a separate, quite room, and take about 15-20 minutes to complete. The parents were given the opportunity to ask and clarify questions.

- Advantages of interview questioner:

- Higher response rate.
- When the interviewees and respondents are face-to-face, there is a way to adapt the questions if this is not understood.
- More complete answers can be obtained if there is doubt on both sides or particular information is detected that is remarkable.
- The researcher has an opportunity to detect and analyze the interviewee's body language at the time of asking the questions and taking notes about it.

Face-to-face interviews can be considered as an important and efficient manner for gathering data in social science research. In comparison with other data collection methods using questionnaires (surveys by mail, through the Internet, by telephone), the personal presence of the interviewer offers the researcher additional opportunities to explain to the respondent what is expected, and to observe the respondent's reaction. He can clarify how the interview differs from a normal conversation. If required, he can explain questions and tasks, and if the respondent fails to

formulate an adequate answer, he can do the necessary probing. In brief, the interviewer can guide the respondent in his task and encourage him to accomplish that task as well as possible. This direct support makes a face-to-face interview particularly suitable for longer and more complex interviews (65).

4.6. Data management and analysis:

Data was uploaded on excel sheets before being transferred to SPSS (IBM version 25).

Descriptive statistics were used to describe study sample distribution in terms of participant's age and gender. Comparisons of dmf scores and oral hygiene scores were conducted using Mann-Whitney U test. Comparisons of proportions of dental anomalies and questions of knowledge and attitude were conducted using Chi-Square test. All statistical tests were conducted p value of 0.05.

CHAPTER FIVE

RESULTS

5. RESULT

5.1.Description of study sample

A total of 81 CHD children and 81 siblings were included in the study. In CHD group 49 were females and the rest 32 were males. In the control group 31 males and 50 females were recruited. The age of the participants ranged between 3 and 12 years of age. The mean age in the CHD group was 7.23 years (SD=5.67) and the control group was 7.88 years (SD=6.1). No statistically significant differences in terms of age and gender between cases and controls.

Table 8: Description of study sample.

COMPONENT	CHD children Mean (SD)	CHD-free children Mean (SD)
Female	49	50
Male	32	31
Age	7.23(5.67)	7.88(6.1)

5.2. Dental caries experience of CHD children

The results of the present study shows the following: generally, children with congenital heart disease (CHD) have higher numbers of decayed, missing, and filled teeth in both primary and permanent dentition, however, the only statistically significant differences was observed in primary dentition (dmf), with *p* value= 0.013, Table 9: Comparison of caries experience in permanent teeth among CHD children (n= 81) and control group (n=81).

Table 9: dmf /DMF difference/comparison between case and control group.

DMF components	CHD Children Mean (SD)	CHD-free children Mean (SD)	P value
Decayed permanent teeth (D)	1.53(1.99)	1.25(1.79)	0.356
Missed permanent teeth (M)	.04(.195)	.05(.350)	0.819
Filled permanent teeth (F)	.05(.276)	.04(.190)	0.692
Total DMF	2.33(2.161)	1.75(2.149)	0.141
Decayed primary teeth (d)	3.99(3.391)	3.02(3.122)	0.064
Missed primary teeth (m)	0.22(0.645)	0.27(0.725)	0.663
Filled primary teeth (f)	0.16(0.674)	0.04(0.247)	0.133
Total dmf	4.68(3.484)	3.30(3.299)	0.013*

Mann Whitney U test was used to compare cases and controls.
*** P≤0.05**

5.3.Oral Hygiene Status

The distribution of debris and calculus in case and control groups is presented in (Table10). There was a statistically significant difference between the two groups (P≤0.05), with CHD children having higher scores of debris, calculus and OHI-S.

Table10: Oral health indicator difference/comparison between case and control group.

Index	CHD Children Mean (SD)	CHD-free children Mean (SD)	P value
CI	1.19(1.883)	0.41(0.932)	0.001**
DI	7.85(3.886)	4.11(2.950)	≥0.001***
OHI-S	1.54 (1.05)	0.73 (0.58)	≥0.001***

Mann Whitney U test was used to compare cases and controls

**** P≤0.01, ** P≤0.001**

5.4. Developmental defects

The data demonstrated significant difference between the two groups in the proportion of dental anomalies (p value-= 0.016). CHD children had higher rates of dental anomalies 17.5 % compares to 2.5% in control group had dental anomalies. Hypoplastic teeth presented in 15%of case group ranged from single tooth hypoplasia to generalized hypoplasia, and 2% of control group. Gemination presented in 1.3% of case group and 0.6%of control group, same percent for missing teeth (congenitally missing) 1.3% of case group and 0.6% of control. (Table 11):

Table 11: Comparison in anomalies between case and control group.

ANOMALIES	CHD N (%)	Controls N (%)	P value
NO. ANOMALIES	14 (17.5)	4 (2.5)	0.016
Hypoplastic teeth	12(15.0)	2(2.5)	
Gemination, fusion	1(1.3)	1(0.6)	
Congenitally missing	1(1.3)	1(0,6)	
Chi- Square test was used to compare proportions of dental anomalies in cases and controls			

5.5. Oral hygiene practices:

Following data analysis, it was found that, no significant difference in tooth brushing between the two groups (P value = 0.354). 29% of cases don't use toothbrush at all, 43% brushing once daily and only 9%brush their teeth twice daily. For control group, 38% do not use toothbrush, 36%brushing their teeth once daily and only 7%brush twice daily (figure1).

About brushing at bedtime, no significant differences in brushing at bedtime, only 16 children brushed their teeth at bedtime, which were 8 in case group and 8 in control group (Figure2).

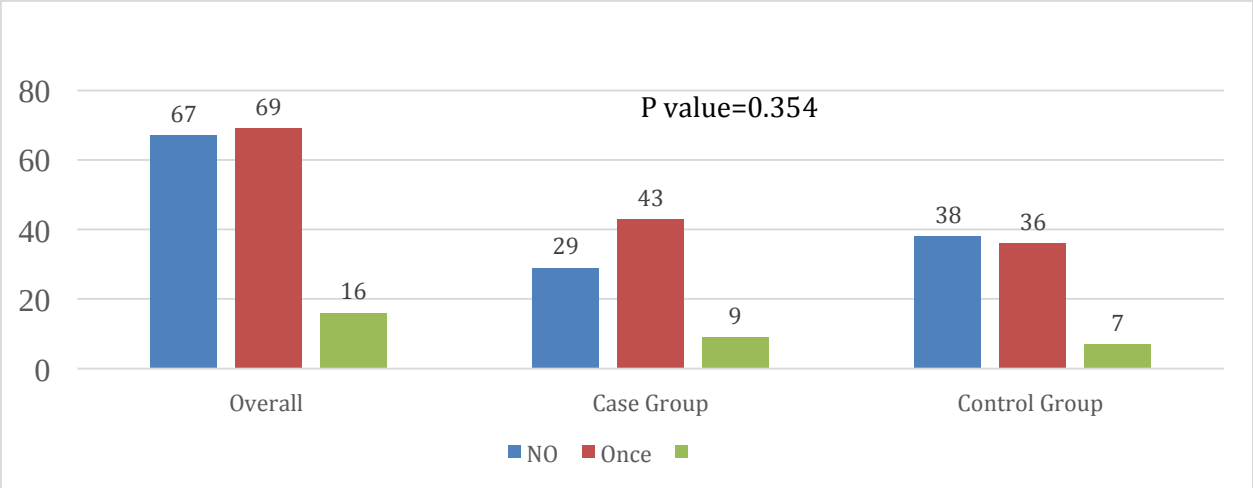

Figure 1: Frequency of tooth brushing.

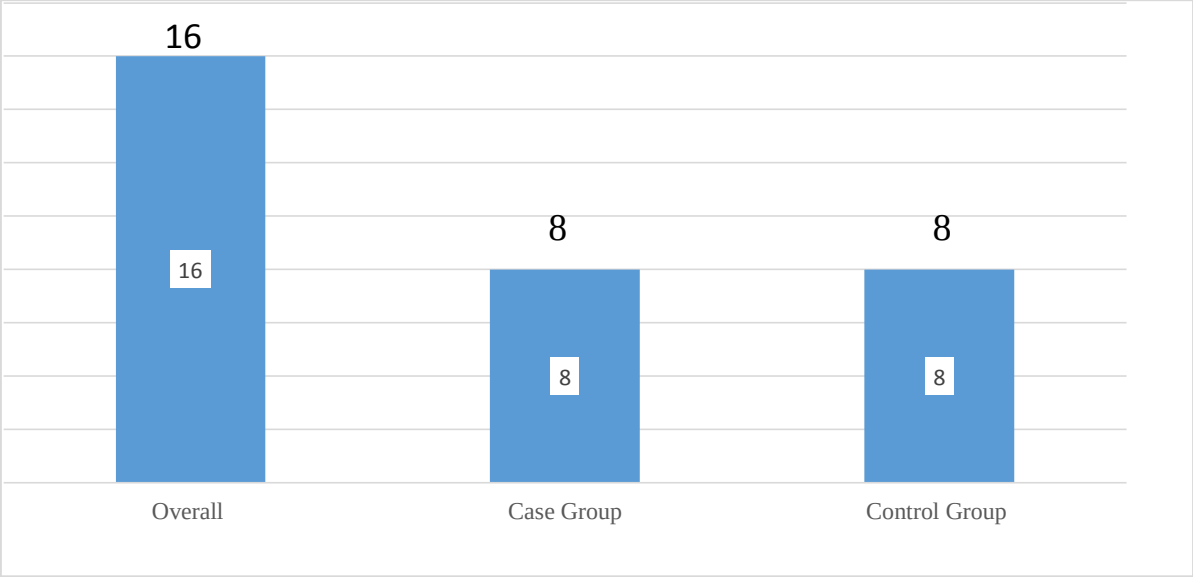

Figure 2 Brushing at bedtime.

About previous dental treatment, no significant difference between the two groups, with p value =0.142. 40.2% of cardiac children group visit dentist before and 30.9% of control group visit dentist before. (Figure 3)

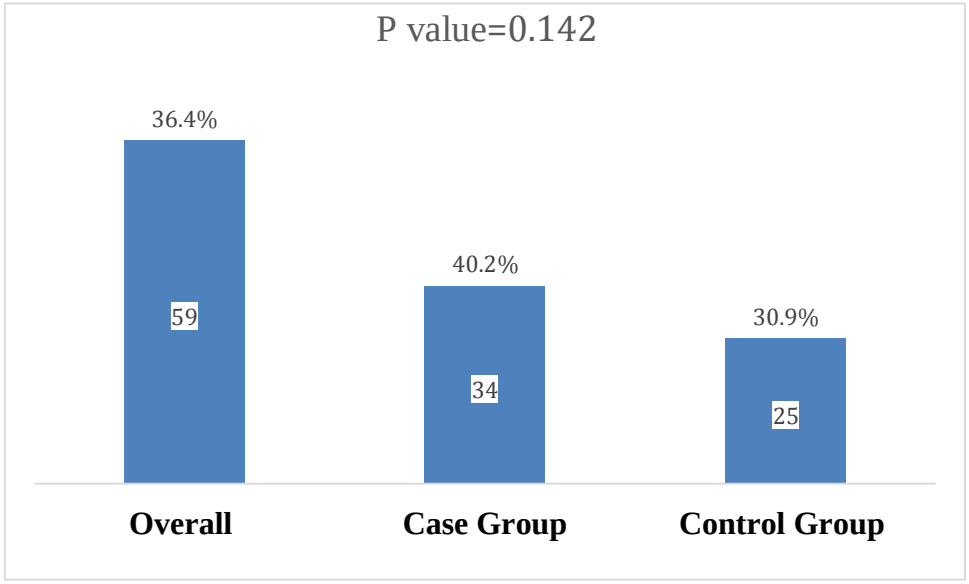

Figure 3: Comparison of previous dental treatments.

5.6. Parents' Knowledge and attitude

Regarding parent's knowledge they have poor knowledge, 9.90 % answered that, they know there are some types of bacteria present in the oral cavity and can lead to serious complication if reach to area of heart defect, 12.30% answered that, they know there is some types of cardiac disease patient may need antibiotic before and may also after dental treatment, and only 10.5% know that the oral health is important and has an effect on cardiac health. (Figure 4)

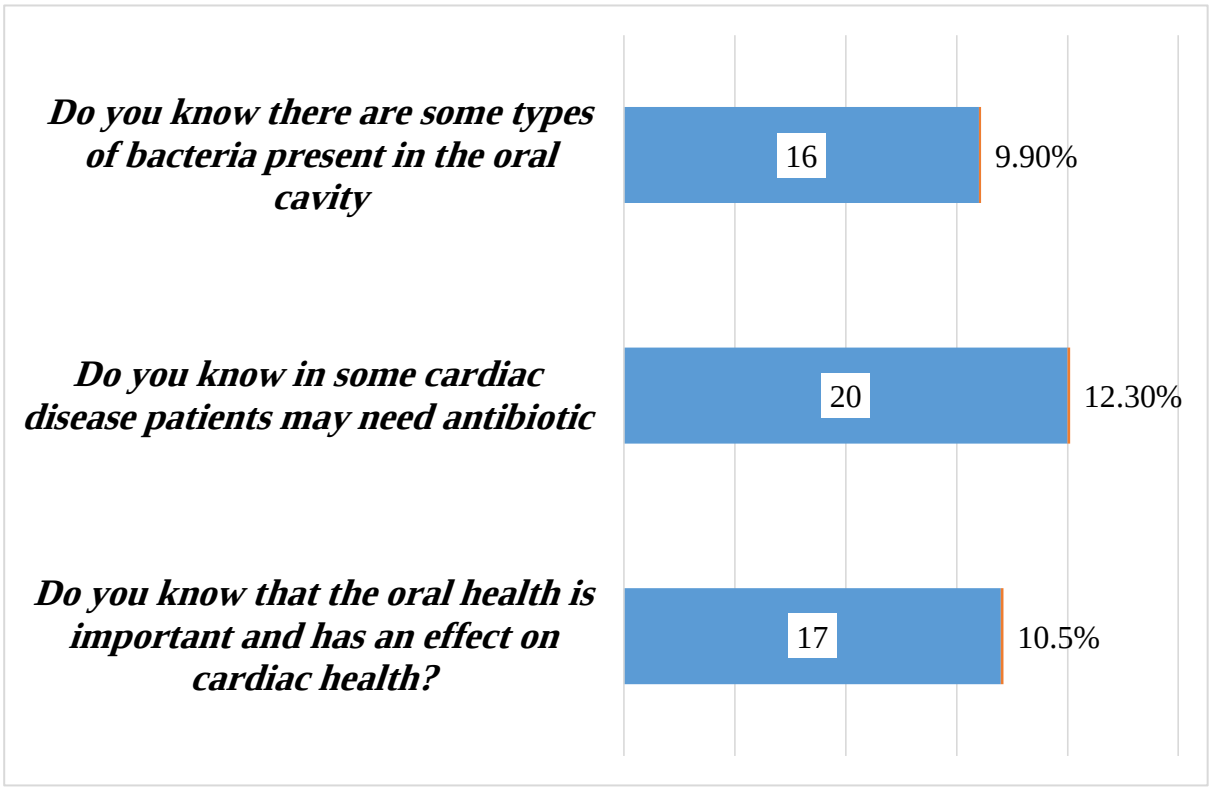

Figure4: Parents and guardians' knowledge regarding oral health with cardiac health.

CHAPTER SIX

DISCUSSION

6. DISSCUSION

6.1. Overview of study design

To authors best of knowledge this is the first study of its type in Libyan children with CHD. The study was conducted in Benghazi, the second largest city in Libya and the capital of the western province. The participants were recruited from the three main pediatric hospitals in the city were medical services are provided to CHD children. The control group was selected from siblings, which minimizes the sociodemographic and behavioral variations in the two study groups. In the case-control design chosen for this study, ideally the same examiner would have examined all the children in both groups to remove the effects of variation in caries diagnosis between different examiners.

6.2. Summary of the main findings

Overall, the results show that, the children with CHD have poorer oral health, with more decayed teeth in primary and in permanent dentition compared with control siblings, although the statistically significant difference observed in primary dentition (dmf). In addition, children with CHD have more developing enamel defects, poorer oral hygiene (represented in debris and calculus index) in comparison with control group.

6.2.1.Caries experience:

In the present study, children with CHD generally, have higher numbers of decayed, missing, and filled teeth in both primary and permanent dentition, than their healthy controls. Similar findings have been observed in several previous studies conducted on different countries such as Sweden (8), Norway (66) and Iran (67) as well as Libya were they have had high number of decayed, missing, and filled teeth (68). for example, the present study's finding corroborate a great deal the findings of a previous study conducted in prince Charles hospital on 39 children with CHD and 33 healthy sibling found statistically significant differences in numbers of decayed, missing and filled primary dentition (dmft), although differences in permanent dentition were not significant (16).

Another example is a study conducted in 2013 in Turkey where 268 children with CHD compared with 268 healthy children, their age between 3-16 years. The authors concluded that although the oral health of children with either congenital or an acquired heart disease was the same as that of the healthy children, there were significant differences in the decayed, missed, and filled teeth indices (13).

On the other hands, some studies found no differences or lower caries experience among CHD children compared to healthy controls (31). For instance, a Turkish study in 2015, included 72 children, CHD children as cases and the control group included 56 healthy children, aged 3-14 years, reported no significant difference in the development of dental caries or the prevalence of enamel defects between children with congenital heart disease and healthy children, the care score was low in children with congenital heart disease (69).

It is unclear why children with CHD have more decayed teeth since such question requires a longitudinal prospective study design. However, there are several possible reasons of this phenomenon. Firstly, it could be the case that these children are more indulged because of their medical status and hence the parents give them more sweets than their siblings. Another possible reason could be related to medication given to these children. For instance, Stecksen's Blicks and colleagues reported that children with CHD had more decayed teeth despite the intensive preventive care provided. They attributed this to late intervention but interestingly; there were a significant correlation between the number of months on digoxin and the dmfs-value. Digoxin is administrated in a sucrose containing syrup (8). In addition, during the first few years of their lives, children with congenital heart disease are generally hospitalised for short or long periods of time for medical and surgical treatment. For this reason, dental problems are expected to be commonly seen in children with this disease. In addition, there are other underlying factors such as nutrition, drug use, and family's socioeconomic status that influence the formation of early dental caries (13).

6.2.2.Treatment needs

One of the interesting findings in the current study was that children with congenital heart disease had a higher rate of missing, decayed teeth and unmet treatment needs. This observation is in line with the findings of previous studies, which reported more extraction and delayed intervention among children with congenital heart diseases (8,69). There are several reasons for the lower percentage of restorative treatment of primary dentition in children with congenital heart disease. First, parents of children with congenital heart disease are not sufficiently informed about the importance

of oral hygiene and adverse effects of dental disease on quality of life (42). Second, the practitioner (general) dentists are reluctant to treat children with congenital heart disease. Third, pediatric cardiologists don't provide adequate information to families of children with congenital heart disease about the importance of oral care (13), The cost factor can be another reason (10).

Owing to the fact that there is a higher risk of developing infective endocarditis in children with congenital heart disease, both pediatric dentists and pediatric cardiologists have great responsibilities regarding the general health status of patients with heart disease, and they should be in close communication during evaluation of these patients.

6.2.3.Dental developmental defect

Previous studies indicated that the prevalence of enamel defect in the general population was between 4% and 25%(70). In agreement with these studies, our study showed that 17.5% children in the congenital heart disease group having developmental defects. In line with previous studies, the present study showed that CHD children had higher rates of dental anomalies as compared healthy controls (16). However, other studies (69,31). did not find a significant difference in terms of the presence of enamel defects.

This finding could be attributed to the fact that ameloblasts are extremely sensitive to metabolic alterations, for example, in cases of CHD, during tooth formation, which can lead to the formation of a thinner and/or softer enamel tissue; in consequence, these teeth are more susceptible to faster destruction due to caries and are more difficult to restore (71). Another possibility could be that in children with congenital heart disease, enamel hypoplasia might be associated with systemic conditions such as surgical complications due to

heart failure and heart disease (16). Early intervention and successful treatment during the early stages of tooth formation has been proposed to reduce the duration and severity of systemic disorders such as cyanosis in patients with congenital heart disease. With advanced examination, diagnosis, and surgical and anesthetic methods, it is expected that the prevalence of enamel defect will decrease in children with congenital heart disease.

6.2.4.Oral Hygiene Status

The present study demonstrated that CHD children had higher scores of debris, calculus and OHI-S than that observed in the control group. This finding is in agreement with previous studies showing high levels of plaque accumulation and gingivitis among CHD children (16). For instance, a study conducted in 2017 including 111 Sudanese children with CHD and 182 controls, reported more plaque accumulation and gingival inflammation among CHD group (14). Another study of 25 CHD children and matched controls reported higher prevalence of periodontal disease, evidenced by gingivitis, plaque, calculus, and recession among CHD group (72).

Oral health behaviors comprise a key determinant of oral health, with regular brushing, using fluoridated toothpaste; regular dental visits and less consumption of sugars being the main favorable behaviors associated with optimum oral health (73). Interestingly, the present study showed no significant difference in tooth brushing frequency among the study groups. However, the reason for increased debris and poor oral hygiene could be attributed to the effect of some medications which reduced the salivary flow rate and reduced anti-oxidative abilities and hence more accumulation of dental plaque among CHD children (74,75). Although this aspect is not fully

understood, further research is required to understand the impact of medication used for CHD children on their oral health and gingival status. However, the fact remains that gingival health and poor oral hygiene can be prevented by implanting appropriate oral hygiene practices.

6.2.5.Parents' Knowledge and attitude

The present study demonstrated that parents of children with CHD had generally poor knowledge. Less than 13% were aware that the oral bacteria can lead to serious complication or that cardiac disease patient may need antibiotic prophylaxis, and the importance of oral health. These findings may provide some explanation of poor oral health reported in the present study among CHD children.

Different studies about the knowledge and attitude of parents for children with CHD found that, parental knowledge was not satisfactory with regards to the importance of the maintenance of good oral health for the prevention of infective endocarditis (10, 15, 35-37).

For example, a study about the parent's knowledge and attitude in Brazil, found that, 9.6% of the guardians understood the meaning of heart infection, 60.6% who knew the possibility of heart disease caused by dental procedures, 72.1% who understood the requirement for antibiotic cover before dental treatment, and who understood the importance of good oral health to prevent infective endocarditis was 41.3%(38). Likewise, a questionnaire survey of parents of 70 CHD children in Bangalore found poor parental awareness on the importance of maintaining good oral hygiene, preventive dentistry, decayed teeth, and its systemic effects (15). In Germany, parents of children with CHD appeared to lack appropriate

information concerning preventive measures and oral hygiene, antibiotic prophylaxis and medications. Also, preventive dental measures were not performed according to current guidelines (40). Dentists have a critical role in promoting oral health as well as boosting general healthy behaviors by delivering an effective oral health advice (23). And act as a role model for their patients and the society as whole.

However, it is well recognized that OHBs are shaped by broader socioeconomic determinants (26). With social gradient favoring better oral behaviors and outcomes among people from higher social class (76-78). In addition, although knowledge is needed to adopt appropriate behaviors bearing in mind that a correlation does exist between better knowledge and improved oral health (79). Knowledge is only weakly correlated with behaviors in cross sectional studies (80). The integrative model (IM) of behavioral prediction suggests that individual's behavior branches reasonably from the stem of their beliefs which, in turn, are shaped by their knowledge and other background factors related to attitudes, social norms, individual skills and environmental factors (81). A recent study found an association between oral health-related beliefs of adults and their oral hygiene habits and dental service use, and that these beliefs are associated with their early life social position and oral health-related beliefs of their parents (82). One way of overcoming these informational barriers is by using dental health education programs. Oral health education and implementation of oral health practices are especially important in preventing dental diseases among children.

Although the current study is based upon cross-sectional design with self-reported data, which have their own inherent weaknesses, it is well accepted that oral health knowledge does not always translate into positive behaviors;

and that wider social and environmental factors determinants of OHB should be considered when designing and planning behavioral interventions or preventive programs, rather than relying only on knowledge and attitude. (80, 83)

6.3. Strengths and limitations

The present study is the first study using case and control groups in investigating oral health status of CHD children. Previous attempt to study oral health status in Libyan children lacks control group and hence our study has superiority in terms of its design and validity. Single examiner collected the data, which minimises the variability in diagnosis of oral health indicators. The data on knowledge and attitude were collected using self-repot by a self-administering questionnaire. Although this method has its own limitations, the research was present at the time of filling in the questionnaire, which helped in the clarification of any question. Yet, there is a risk of social desirability bias and recall bias when such type of data collection methods is used.

Another limitation in the present study was that we were not able to reach the sample size determined at the beginning due to many reasons. First, it was difficult to recruit the targeted age group because of administrative issues at Benghazi hospitals. Most of the cases were preschool children. To sort this issue, we decided to include two more cardiac centers, which were, Benghazi Medical Centre (BMC) and Benghazi Cardiac center (BCC). Second, many CHD children had other medical problems and therefore excluded from the study. Third, 80 CHD children had no siblings closer to their age and from the same gender. However, reducing sample for these

reasons while decrease the generalisability of the study it increases its internal validity.

CHAPTER SEVEN

CONCLUSION AND

RECOMMENDATIONS

7.CONCLUSION AND RECOMMENDATIONS

7.1. CONCLUSION

The result of this study conforms previous research showing that children with congenital heart disease have poorer oral health, higher numbers of decayed, missing, and filled teeth and more dental anomalies in comparison with their healthy siblings. However, both groups generally having poor oral health. Parental knowledge was poor and there was a lack of appropriate oral health behaviors.

7.2. RECOMMENDATIONS

Based on the finding of the current study the following recommendations are suggested:

1. Oral health education programs targeting parents of children with CHD are required to promote oral health in this group.
2. Preventive oral health programs should be introduced early to minimise the complication and the need for intensive dental care.
3. Future research should explore awareness and competence of Libyan dentists to manage CHD children.
4. Future research should investigate the saliva profile of Libyan children with CHD.

CHAPTER EIGHT

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APPENDICES

Case group

1 Patient name: ----------.

2 Gender: ----------.

3 Date of birth: ----------.

4 Diagnosis of your child's congenital heart disease: ----------.

5 Address: ----------.

6 Telephone number: ----------.

7 file number: ----------.

Medical history

8 Does your child has any other medical problem:

Yes no

9 If yes what is his /her medical problem: ----------

---

10 Have your child did subjected any cardiac surgery: ----------
---

---

11 Did your child take any medication:----------

Parent knowledge

12 Do you know that the oral health is important and has an effect on cardiac health?

Yes no

13 Do you know in some cardiac disease cases may need antibiotic before dental treatment?

Yes no

14 Do you know there is some types of bacteria present in the oral cavity and if reach to some areas of the heart defect can lead to serious complication?

Yes no

Dental history

15 Frequency of tooth brushing:

No brushing once daily. Twice daily

16 Brushing at bedtime:

Yes no

17 Have your child visited a dentist before:

Yes no

18 What is the dental treatment provided to your child? ----------

---

---

19 Have your child given any medication that his cardiologist advice before dental treatment:

Yes no

If yes describe type, dose of medication, and time of medication taking before dental procedure

Dental examination

Upper teeth															
8	7	6	5	4	3	2	1	**1**	2	3	4	5	6	7	8
			E	D	C	B	A	A	B	C	D	E			
Lower teeth															
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			E	D	C	B	A	A	B	C	D	E			

20 Caries experience DMFT (permanent teeth) //dmft

(Primary teeth)

D = M = F = DMFT =

d = m = f = dmft

21 Oral Hygiene Index-Simplified (OHI-S)

Debris index

16	11	26
46	31	36

calculus index

16	11	26
46	31	36

Oral Hygiene Index-S = Debris Index + Calculus Index

6

OHI –S = …….....……

22 Dental or any hard or soft tissue anomalies or defects: ----------
---

Control group

1 Child name:

2 Gender:

3 Date of birth:

4 Addressees:

5 Telephone number:

Medical history

6 Does your child has any medical problem?

Yes no

(a) If yes what is his/her problem? ----------

(b) Medication taken: ----------

Dental history

7 Frequency of tooth brushing:

No brushing. Once daily. Twice daily.

8 Brushing at bedtime:

Yes no

9 Fluoride supplement:

Yes no

10 Does your child visit a dentist before?

Yes no

11 What is the dental treatment given to your child? ----------

---

Dental examination

Upper teeth															
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			E	D	C	B	A	A	B	C	D	E			
Lower teeth															
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			E	D	C	B	A	A	B	C	D	E			

12 Caries experience DMFT (permanent teeth) //dmft

(Primary teeth)

D = M = F = DMFT =

d = m = f = dmft =

13 Oral Hygiene Index-Simplified (OHI-S):

Debris index

16	11	26
46	31	36

Calculus index

16	11	26
46	31	36

Oral Hygiene Index-S = Debris Index + Calculus Index

6

OHI –S = …….....……

14 Dental or any hard or soft tissue anomalies or defects:

موافقه للإشتراك في بحث علمي

إسم الباحث: ريهام عبدالهادي العوامي
عنوان البحث: الأعراض الفمويه للأطفال المرضي بأمراض القلب الخلقيه مقارنه باخوتهم الأصحاء، ،مدي المعرفه لدي أولياء أمورهم.
مكان إجراء البحث: مستشفي الاطفال بنغاري.مركز بنغازي الطبي.مركز القلب الهواري.
أنت مدعو/مدعوه للمشاركه ببحث علمي الرجاء أن تاخذ الوقت الكافي للقراءه .بامكانك طلب أي إيضاحات أو معلومات إضافيه عن أي شيء يخص هذه الدراسه

وصف الدراسه
أثبتت العديد من الدراسات التي أجريت حول العالم أنه يوجد علاقه قويه بين صحه الفم وصحه القلب لدي الأطفال مرضي القلب، وأنهم لديهم بعض الأختلافات مقارنه بغيرهم من الأطفال ،وأن مضاعفات قد تحدث في كثير من الأحيان للقلب في حال كانت صحه الفم غير جيده.
في ليبيا لايوجد أي دراسه لتثبت أو تنفي ذلك.
في هذي الدراسه سأقوم بالكشف علي فم وأسنان طفلك/طفلتك المصاب بإحدي أمراض القلب الخلقيه ويقارن بأخ او أخت له الأقرب له في العمر .
لن يكون هناك أي تدخل علاجي لطفلك/طفلتك مالم تستدعي حالته ،الدراسه عباره عن كشف فقط و إذا كان هناك خروج بعض قطرات من الدم من اللثه أثناء الكشف ستكون بنفس الكميه أو أقل من الكميه التي تخرج أثناء تناول الطعام والمضغ وعند إستعمال الفرشاه لتنظيف الأسنان. وبعض الاسئله المتعلقه بحاله طفلك ستطرح عليك لتقوم بالاجابه عليها .
لك الحق في رفض أو قبول المشاركه في هذه الدراسه.

في حال وافقت علي علي المشاركه في هذه الدراسه سيبقي أسمك طي الكتمان ولن يحق لأي شخص مالم ينص القانون الإطلاع علي بياناتك بإستثناء المسؤولين عن هذي الدراسه.

موافقه الباحث:

لقد قمت بالشرح بالتفصيل للأخ/الأخت ـــــــــــــــــــ المسؤول عن الطفل /الطفله ـــــــــــــــــــــــ-
وصلته به / بها ـــــــــــــ وقد أجبت علي كل أسالته بوضوح بأفضل صوره أستطيعها وسوف تعلم المشترك بأي تغيرات في مجريات البحث أو تاثيراته السلبيه و فوائده في حال حدوثها أثناء البحث.
أسم الباحث:
توقيع الباحث:

<u>موافقه المشترك</u>
لقد قرأت إستماره القبول هذه وفهمت مضمونها وتمت الإجابه علي أسئلتي جميعها وبناءا عليه فإنني بكامل حريتي أوافق علي الإشتراك في هذا البحث .
إسم المشترك ـــــــــــــ

توقيع المشترك ـــــــــــــ

التاريخ ـــــــــــــــــ

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كلية طب وجراحة الفم والأسنان

Index: ..... الرقم الإشاري : Date: ..... الموافق : ..... التاريخ : .....

رئيس قسم أمراض القلب بمستشفي بنغازي الطبي

بعد التحية :-

نعلمكم بأن الطالبة ريهام عبد الهادي العوامي طالبة الدراسات العليا مرحلة البحث بقسم طب أسنان الأطفال بكلية وجراحة الفم والأسنان جامعة بنغازي وعليه يرجي من سيادتكم السماح لطالبة بالقيام بالكشف علي الحالات الأطفال الذين لديهم congenital h earth disease للوقوف علي صحة الفم والأسنان لهذه الفئة من الأطفال.

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التاريخ : 2021 / 2 / 1

الرقم الإشاري :.....

السيدة/ مدير مكتب الدراسات العليا والتدريب

بعد التحية ،، ،،

نفيدكم علمـــاً بـإن طالبـة الدراسـات العليـا بقسم طـب أسـنان الاطفال / **رهام عبدالهادى العوامى**، قد أنهت موضوع الدراسة البحثية .

نأمل منكم عرضها على لجنة الدراسات العليا في الاجتماع القادم.

نشكركم

وَالسَّلَامُ عَلَيْكُمْ وَرَحْمَةُ اللَّهِ وَبَرَكَاتُهُ ،،

د. فوزية مفتاح الزاوى

رئيس قسم طب أسنان الاطفال

والمنسق المكلف للدراسات العليا بالقسم

1-2-2021

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Oral Health Of Children With Congenital Heart Diseases In Comparison With Healthy Siblings, And Their Parent's Knowledge And Attitude

By: RIHAM A. M EL AWAMI (BDS)

Thesis proposal

For partial fulfillment of requirement

For the degree of master science

In

Pediatric dentistry

Supervisor: Dr.Khadija Herwis

Faculty of dentistry

University of Benghazi

Benghazi – Libya

2018

Introduction

Congenital heart diseases (CHDs) are abnormalities in the cardiocirculatory structure or function due to abnormal heart development during fetal life. [1, 2] Among birth defects, CHDs are the most common type, [3] occurs approximately 8:1000 live births [4]

Congenital cardiac disease (CCD) is one of the most common developmental anomalies in children. Affected children require special care in dentistry because of their susceptibility to infective endocarditis from oral infections, yet little information is available on the oral health of children with CCD. [5] Children with congenital heart diseases are at increased risk of developing oral diseases, such as: higher number of decayed teeth, developmental anomalies, periodontal disease, malocclusion, dental crowding, as well as susceptibility to develop infective endocarditis from bacteremia caused by chronic poor oral health. [6]

Changes in bone density and bone age delay in CHD children have been reported. Oral manifestations recorded for patients with CHD were Cyanosis, pale tissues and cleft palate and lip. Other clinical findings associated with CHD include delayed teeth eruption, teeth hypoplasia [7, 8] and high caries incidence. [9]

The CHD leads to alteration in the structure of enamel and dentin of deciduous incisors on ultrastructural levels, in addition to a significant decrease in mineral content (Ca^{++} and P^{-}) of deciduous enamel and dentin when compared with healthy one rendering the dentition at increased risk of dental caries. [10]

The causative microorganism for infective endocarditis in more than 60% of the patients with positive hemoculture of viridans streptococci (s.mutans, s.mitior) thus making it mandatory for these children to maintain their oral health. [4] Bacteremia after toothbrushing is associated with poor oral hygiene and gingival bleeding after toothbrushing. Improvements in oral hygiene may reduce the risk of developing IE. [11]

Since 2008, National Institute of Clinical care and Excellence (NICE) clinical guidelines has stated: 'Antibiotic prophylaxis against infective endocarditis is not recommended for people undergoing dental procedures'. This put UK guidance at odds with guidance in the rest of the world, where antibiotic prophylaxis is recommended for patients at high-risk of infective endocarditis undergoing invasive dental procedures. Many dentists also felt this wording prohibited the use of antibiotic prophylaxis, regardless of the wishes of the patient or their personal risk of infective endocarditis and made it difficult for them to use their clinical judgment to deliver individualised care in the best interests of their patients. NICE have now changed this guidance to 'Antibiotic prophylaxis against infective endocarditis is not recommended *routinely* for people undergoing dental procedures. [12]

Dentists should emphasise that good oral hygiene and regular dental review are as important as antibiotic prophylaxis (if not more so) in reducing the risk of infective endocarditis. The European Society of Cardiology (ESC) recommends strict dental and cutaneous hygiene with dental follow up at least twice a year in high-risk patients and once a year for all other (that is, moderate risk) patients at risk of infective endocarditis. [12]

Parent attitude and knowledge about the importance of oral health and it is relation with cardiac health is very important. Parents had low level of knowledge towards oral and dental health. [13] However, little information in Libya is available regarding oral manifestations in patients with congenital heart defects, and parent's knowledge despite the importance of these diseases.

The Aims

1-To assess the oral hygiene oral hard and soft tissues anomalies and dental caries in a group of Libyan children with congenital heart defects CHDs (cases) and compare them with children without CHDs (controls).

2-To assess the parent knowledge about the importance of oral health and its relation with cardiac condition.

Materials and methods

Patients with congenital cardiac disease will be children attending the pediatric cardiology clinic at pediatric hospital, the major center for treatment of cardiac disorders in the east of Libya. Both of cyanotic and a cyanotic heart disease patients.

Control patients:

Healthy siblings of the patients served as control patients. Wherever possible, the siblings selected for comparison were closest in age and matched for gender to the patients with congenital cardiac disease (CCD)

The consent well be taken from the parent or who are responsible about the patient and can give me the consent.

All oral examinations were performed by one author, the oral hard and soft tissues well be examined using sterile a disposable mouth mirror, dental probe, gloves well be used and examination well be done at daylight.

The teeth will be dried and examined for discolorations, developmental abnormalities dental caries, all oral hard and soft tissues will be examined for any anomalies or diseases, and any malocclusion. Number of sample will be 200 children, all patients who comes for follow up in the hospital and their age between (3-16) years old will be included in the study, except who will be refuse to be included in the study, or who has any syndromes like down syndrome that already has effect in oral structures, and who does not has sibling for comparison

And their parent will be asked about their knowledge about the oral health and its relation with cardiac health

Indexes will be used are:

Oral hygiene index.

DMF. dmf

The OHI-S (modified for deciduous dentition) was used as the gold standard for oral hygiene assessment in this validation study. The presence of plaque was verified on the buccal surface of 6 index teeth: the upper right second deciduous molar (tooth 55), the upper right central deciduous incisor (tooth 51), the upper left second deciduous molar (tooth 65), the lower right second deciduous molar (tooth 85), the lower left central deciduous incisor (tooth 71), and the lower left second deciduous molar (tooth 75). According to the OHI-S, dental plaque is defined as a soft organic material loosely adhering to the tooth surface. The tooth surface covered by plaque was estimated by visual examination according to the following criteria: 0 = no plaque present; 1 = plaque covering no more than 1/3 of the surface in question; 2 = plaque covering more than 1/3, but no more than 2/3 of the surface; 3 = plaque covering more than 2/3 of the surface. [(14)]

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ARABIC SUMMURY

صحة الفم للأطفال المرضى بأمراض القلب الخلقية مقارنة بإخوتهم الأصحاء ومدى معرفة وسلوكيات أولياء أمورهم.

اعداد

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تحت إشراف:

أ.د خديجه حرويس الملخص العربي

الملخص

الغرض من الدراسه: الهدف من هذه الدراسه المقارنه المستعرضه هو تقييم صحة الفم لدي الأطفال الليبين المصابين بأمراض القلب الخلقيه و مدي إحتياجاتهم العلاجيه.

المواد والطريقه :عدد 81 طفل من الأطفال المصابين بأمراض االقلب الخلقيه ويتم مقارنتهم بعدد81 طفل من أخوتهم الأصحاء، في معدل التسوس (النخر)،لأسنان المفقودة، والممتلئه،ومؤشر صحة الفم البسيط،الشذوذ السنيه.

يسأل الوالدين (أولياء أمورهم)عن مدى معرفتهم بصحة الفم و أهميتها لصحة القلب وسلوكياتهم.

النتيجه :نتيجة هذه الدراسه الحاليه أن الأطفال المرضى بأمراض القلب الخلقيه عامة لديهم معدل أعلي في الأسنان المنخوره اللبنيه والمستديمه ومع ذلك الإختلاف الإحصائي ذو المغزى الوحيد كان ملحوظا في الأسنان اللبنيه.

فيما يتعلق بمؤشر صحة الفم البسيط كان هناك إختلاف إحصائي ذو مغزي بين المجموعتين.

فيما يتعلق بإستعمال الفرشاه لا يوجد إختلاف إحصائي ذو مغزى بين

المجموعتين،فيما يتعلق بمدى معرفة الوالدين (أولياء الأمور) وسلوكياتهم،كان لديهم مستوى معرفه ضعيف عن صحة الفم و أهميتها وعلاقتها بصحة القلب والإحتياج للمضاد الحيوي الوقائي قبل علاج الأسنان.

الخلاصه :هذه الدراسه المستعرضه تظهر أن الأطفال المرضى بأمراض القلب الخلقيه لديهم صحة فم سيئة مقارنه بإخوتهم الأصحاء،وكلاهما لديهم صحه فم سيئه والوالدين (أولياء الأمور) لديهم معدل معرفه وسلوكيات ضعيفة عن صحة الفم وأهميتها و علاقتها بصحة القلب .

صحة الفم للأطفال المرضى بأمراض القلب الخلقية

مقارنة بإخوتهم الأصحاء ومدى معرفة وسلوكيات

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قدمت هذه الرسالة استكمالا لمتطلبات الحصول علي درجة الماجستير في طب فم

الأطفال

جامعه بنغازي

كليه طب وجراحة الفم والأسنان

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