

Comparison of DMFT index and oral bacterial loading of *Streptococcus mutans* in children afflicted with congenital cardiac diseases and children with no cardiac diseases

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ABSTRACT

The objectives of this study are to determine the DMFT index, and oral bacterial loading of *Streptococcus mutans*, in children afflicted with congenital heart disease (CHD) with children who were not afflicted with CHD. Using the methodology of the World Health Organization, decayed, missing filled teeth (DMFT) and permanent DMFT will be compared. Standard oral microbiological techniques were used to isolate *S. mutans*. *S. mutans* is known to be one of the pathogens that cause infective endocarditis; it is a major cariogenic pathogen that is a normal inhabitant of the oral cavity, it was detected at high frequencies and quantities in both heart valve tissues and atheromatous plaque samples in few studies. We undertook this study to determine the oral health status and bacterial loading of *S. mutans*, sp., of children with CHD with that of children who were not affected by any CHD.

KEY WORDS: Cardiac, Children, Congenital, Dental, Disease, DMFT, Health, Oral

INTRODUCTION

Dental health is one of the most important health burdens of children health. Congenital heart disease (CHD) is one of the most common congenital anomalies in children. The incidence of severe to moderately severe CHD is 6/1000 live births. Progress in medical and surgical treatment has resulted in increased survival, and today, a majority of children with CHD reach adulthood without any difficulties. Although the medical care for children with CHD has improved, this group of patients still has special needs.^[1-5] Despite good dental care and intensive prevention, poorer dental health has been seen in children with CHD than in healthy children.^[4]

Children with CHD have a higher prevalence of caries and a greater proportion of untreated caries lesions than healthy children. In addition to the risk of dentoalveolar infections, children with CHD who require cardiac surgical intervention are also at risk for infective endocarditis.^[1] Despite these increased risks, a high proportion of children with CHD has

never had a dental examination even though one is recommended for all children by 12 months of age.^[8]

Despite these children being “at risk” from dental disease, many are apparently not given oral hygiene instruction, dietary counseling, or advice on the use of fluoride supplements. Some dental practitioners seem unwilling to treat children with heart defects and there is a lack of specially trained personnel to whom they may be referred.^[5]

In children with complex heart diseases, other problems often appear that may jeopardize dental health. For example, many of these children have difficulties with nutrition during their 1st year of life. Vomiting is a common problem, and to compensate for this, they should be fed frequent and night meals are often necessary to maintain energy intake at an acceptable level. In addition, some of the medicines for heart disease contain sucrose together with diuretics that can cause xerostomia. Infections often last for longer periods than in normal children with an increased need for drinking, sometimes at night, when salivary protection is low.^[6-10]

Tooth decay remains one of the largest and most common issues facing the oral health children. The

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bacterium *Streptococcus mutans* is recognized as the leading contributor in the formation of dental caries all across the world. Maintaining proper oral health and functionality in the teeth is necessary as it plays a role in mastication, speech, and overall structure and appearance of the face. As a result, much attention is placed on methods that prevent the buildup of the bacterium in the mouth which interacts with the harsh environment, ultimately causing cavity development.^[11-15] In addition to being the cause of caries, the bacterium is thought to play a role in cardiovascular disease. A surge of studies began to identify traces of *S. mutans* to be present in the bloodstream of patients with endocarditis, a form of cardiovascular disease. Although the topic was slow to gain supporting evidence, this suggested that a link existed between the oral microbe and the disease.^[9]

The aim of this study was to compare and examine oral colonization of bacteria associated with caries development in children with CHD and to investigate the DMFT scores with healthy controls.^[3]

MATERIALS AND METHODS

Study Population

A total of 10 children aged 2–10 years with CHD attending Sri Jayadeva Institute of Cardiovascular Sciences and Research in Bangalore formed the study group. The control group comprised other children who were in good general health. Informed consent was obtained from the participant’s parents who were provided with detailed information on the study protocol.

Visual Examination

The study children were examined in the cardiac ward when admitted. In both groups, the teeth were examined visually. The methods for examination were those of the World Health Organization guidelines for basic oral health surveys.

The total number of decayed, missing filled teeth (DMFT) was recorded for each patient. No radiographic examination was undertaken. It was examined visually. Data were recorded in an excel table using patient names.^[1]

Microbial Sampling

The buccal swabs were obtained by rubbing the cheek for 30 s and placing it in a sterile tube.

The buccal swabs were then sent to a laboratory for identification of the different bacteria present in the oral cavity.

RESULTS

The results of this study indicated that there were significant differences in dmfs between the study

and control groups [Table 1]. The control group had a mean dmfs score of 0.55 and the cardiac group had a mean dmfs score of 3.89, the cardiac group clearly had a higher score.

Whereas in relation to the oral bacterial loading, the cardiac group had a mean of 0.67 and the control had a mean of 0.27 for the presence of *S. mutans* [Table 2].

The results were statistically analyzed and the results of the dmfs score indicated that the cardiac group had poorer oral hygiene in comparison to the control

Table 1: dmfs between the study and control groups

Age	Control group		Cardiac group	
	Variable	Mean	Variable	Mean
2–16 years	dmfs	3.89	dmfs	0.55

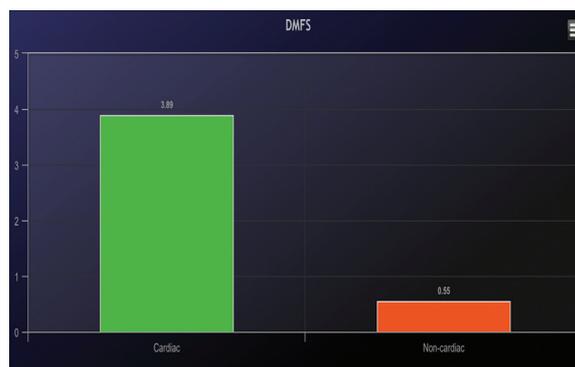


Table 2: Relation of the oral bacterial loading in the cardiac group and control group

Organism	Cardiac group	Control group
<i>Streptococcus mutans</i>	0.67	0.27



group, whereas there was no significant difference in the presence of *S. mutans* in both the groups.^[16-20]

DISCUSSION

The results of this research indicated that there were significant differences in dmfs score between the

study and control groups. Findings of Sarheed *et al.*^[19] and Balmer *et al.*^[20] were in agreement with our results. In Sarheed *et al.* study, children with heart transplants had significantly greater number of enamel defects and more gingival enlargement and bleeding. In another study, children with CHD had significantly more caries in primary teeth, but such a difference was not seen in permanent teeth. In children with cardiac problems, especially complex heart diseases, other problems often appear that may jeopardize dental health. Families of children with serious heart diseases already face heavy demands due to medication, surgery, recurrent illness, and occasional nutritional problems of their children. Preventive strategies for oral and dental disease have a critical value in these children.

Perhaps, poor condition of primary teeth in cardiac children could be related to the difficult situations that these children face during their 1st year of life. The overall increased vulnerability of the cardiac children to stressful treatment procedures is one of the major reasons to focus on caries prevention.^[1] Untreated caries can be a contraindication for heart surgery.^[4]

Various studies have revealed that different locations in the oral cavity, such as tooth surfaces, mucous membranes, and periodontal spaces, are colonized by different microbial populations. The mouth's ecosystem is influenced by chemical and physical fluctuations owing to food intake or oral hygiene measures. Nevertheless, the oral microbe community has been shown to remain relatively stable compared to those of the skin or the digestive tract.^[7]

In this study, there was no significant difference in the presence of *S. mutans* in the oral cavity; however, the cardiac group did have a higher rate than that of the control.

A recent study held in the United States also reported the presence of *S. mutans* in cardiovascular specimens, though the frequency was relatively low at approximately 20%.^[10] A significant difference in oral hygiene (DI-S) was found between the cardiac children and healthy controls. This was in accordance with the findings of the previous study.^[8] Periodontal infections and poor oral hygiene may spread heart-threatening bacteria. Therefore, it is critical to maintain a good oral and dental health by brushing twice daily with a fluoride-containing toothpaste and flossing. In fact, taking good care of teeth and gums is not only for a healthy smile but also for a healthy body in cardiac patients.^[3] Poor dental hygiene also gives an increased risk of dental bacteremia that may lead to infective endocarditis.^[1] One study revealed that 35% of parents were aware of the importance of good oral health in cardiac children, but they had no knowledge of infective endocarditis. These figures were 41.3%

and 18% in the previous study, respectively.^[8] Balmer *et al.*^[7] found that 64% of parents were aware of the link between the oral health of their children and infective endocarditis. Parental knowledge of cardiac diseases in developed countries may be due to a better public awareness and close interaction between pediatric cardiologist and dentist. Most parents of sick children in our study were of moderate economic status, so we recommend delivering proper information to parents in health centers and cardiac clinics regarding preventive dentistry to maintain an excellent oral health.

Studies have shown that patients with CHD have poorer oral health than other healthy patients.

They are at increased risk of developing oral diseases and the consequences of these are much greater than in healthy patients.^[18] Many of these patients have a high caries activity and untreated gingivitis.^[11] Unfortunately, dental care is often a low priority in this group.

Dentists play an important role in raising awareness of the importance of good oral health among these patients and their families and providing them adequate oral health care.

General practitioners should focus on caries prevention and give these patients dietary advice, oral hygiene instruction, and fluoride supplements if necessary.

Several children with CHD experience long hospital stays due to surgery or illness. Many of them have never been to a dentist until a caries problem is evident.^[2] They also have an increased vulnerability to stressful dental procedures making the use of sedation techniques an important aspect in the dental treatment of these patients.

Poor oral hygiene has been shown to be a risk factor for infective endocarditis.^[3]

Optimal oral hygiene may reduce the incidence of bacteremia from daily activities and maintenance of good oral health probably plays a more important role than prophylactic antibiotics before dental procedures.^[12]

Avoidance of dental disease in patients susceptible to endocarditis should be given more attention.

The revised guidelines related to antibiotic prophylaxis emphasize the importance of establishing good dental hygiene for this group.

A closer collaboration between all medical professionals is needed.

Cooperation between cardiologists, nutritionists, dentists with special training, and general dentists could help improve dental care for these patients and improve general dentists confidence in treating

this group of patients. They must receive maximal preventive dental care to minimize the need for dental procedures.^[13] Parents of children with CHD should also be given information in how to prevent oral diseases in their child.

Children with CHD should have their first dental check-up when they are 1–2 years old and the check-up intervals should not exceed 6 months.^[14]

Several evidence-based guidelines for the prevention and management of dental caries in “at-risk” children are available and should be followed.^[15]

Cardiovascular disease in children complicates dental care for three reasons: The risk of a dental bacteremia that may lead to infective endocarditis, the increased risks associated with general anesthesia in a child who has usually had several surgical procedures, and the risk of prolonged bleeding in children taking warfarin.^[3] In addition, there is the additional morbidity, often considerable, associated with pain and infection in the mouths of children afflicted with recurrent problems associated with their underlying cardiac disorder.

CONCLUSION

A detailed knowledge of the dental and oral conditions of such children is essential if preventive care is to be directed effectively. There are not enough data available on the levels of dental disease in children with cardiac disorders.^[2]

Further improvements should be made in educating parents and children on the importance of caries prevention and maintaining a good oral hygiene. It is recommended that pediatric cardiologists and dentists have more cooperation and that all cardiac patients have a dental examination and preventive dental program implemented.^[6]

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