

**ORAL HEALTH STATUS OF CHILDREN WITH
CARDIAC DISEASE AND THE AWARENESS,
ATTITUDE AND KNOWLEDGE OF THEIR PARENTS**

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In partial fulfillment for the degree of

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PEDODONTICS AND PREVENTIVE DENTISTRY

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CERTIFICATE

This is to certify that this dissertation titled "ORAL HEALTH STATUS OF CHILDREN WITH CARDIAC DISEASE AND THE AWARENESS, ATTITUDE AND KNOWLEDGE OF THEIR PARENTS" is a bonafide record of work done by **Dr. V.MADHAVAN**, under my guidance during his postgraduate study period between 2008-2011.

This dissertation is submitted to **THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY**, in partial fulfillment for the degree of **Master of Dental Surgery** in Branch VIII -Pedodontics and Preventive Dentistry.

It has not been submitted (partially or fully) for the award of any other degree or diploma.

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INTRODUCTION

The prevention of oral disease is the most desirable way of ensuring good dental health for children with cardiac disease. Oral cavity is a natural source of many microorganism and alteration in oral health leads to changes in the eco system where some of the organisms become pathogenic and move into the blood stream leading to septicaemia. Dental and gingival infections in patients with cardiac disease may lead to several cardiac complications.¹⁸ Many situations in which bacteraemia occur, may not be readily identifiable, and other bacteraemia may occur spontaneously and cannot logically be prevented. All children at risk should be properly instructed to establish and maintain best possible oral health to reduce these potential sources of bacteraemia.^{26,29}

In children with complex heart disease, other associated problems often appear that may jeopardize dental health. Many of these children have difficulties with nutrition during the first year of life. Vomiting is a common problem and to compensate for this they should be fed frequently 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.²⁷ Infections often last for longer periods than in normal children with an increased need for feeding, sometimes at night when salivary protection is low.⁴⁸

It appears that despite increased awareness, children most at risk from serious complications of dental disease are not receiving a satisfactory standard dental care. It is of considerable importance to the children with congenital heart disease to maintain optimal oral health. Because of the open carious lesions, extensive deposits of plaque, and widespread areas of gingival inflammation which represent an enormous bacterial loading of viridans streptococci within the mouth.¹⁶ This is important in further development of dental disease and the potentially life threatening condition of bacterial endocarditis from viridans streptococci.

The three main concerns when providing dental care for patients with valvular heart disease

- risk of infective endocarditis
- risk of bleeding in anticoagulated patients
- risk of exacerbating any co existing heart failure .⁵¹

When these patients present themselves to the general dentist for routine care, the dentist should have the knowledge about implications of this disease process and treatment approaches to treat the patients safely and effectively.⁵⁰

Considering all these aspects, the importance of evaluating the practice and oral health conditions of children at risk for infective endocarditis was recognized, as was the need to discover the extent of their parental awareness.⁹ This study was done to determine the oral health status of children and the parental knowledge on the importance of oral health in preventing cardiac complications.

AIMS AND OBJECTIVES

The aim of this study was

- To assess the oral health status of children with cardiac problems.
- To determine their parental knowledge, attitude and awareness about the cardiac disease, importance of maintaining oral health and importance of infective endocarditis prophylaxis to prevent cardiac complications

REVIEW OF LITERATURE

McIntyre H (1960)³¹ studied indications for extractions in cardiac patients with dental infections. 313 patients at the Manchester royal infirmary were studied. A simple procedure was followed to encourage cardiac patients. Antibiotic cover with one single pre operative injection of soluble penicillin 0.5mega unit and procaine 0.3mega unit was administered to prevent subacute bacterial endocarditis. 2% lignocaine with 1/80000 adrenaline was used as an anaesthetic. General anaesthesia was not used unless hospitalization was required. Anticoagulants were discontinued 2 days prior to extraction. It was found that in the 313 cases studied no deterioration of cardiac conditions attributable to dental treatment occurred.

Mattila KJ, Markku S et al (1989)³⁰ studied the association between dental health and acute myocardial infarction. The role of chronic bacterial infections as risk factors for the disease and the association between poor dental health and acute myocardial infarction was studied. Two series of patients with acute myocardial infarction and controls were studied. The first series had 40 men admitted in Helsinki university central hospital because of acute myocardial infarction. It was a computer based random sample of 41 men with the same age group and from the same area, one of them was taking

a beta blocker for hypertension .The second series studied had 60 people with acute myocardial infarction. In both series computer matched control was examined .Dental health was studied by 2 methods –measuring the severity of teeth infections and periodontium. A systematic clinical and radiological study was done. These studies showed that dental health was significantly worse in patients with acute myocardial infarction than in controls.

Cannel (1991)⁷ studied the efficacy of two macrolide antibiotics to prevent post extraction bacteraemia. Erythromycin and josamycin were the two macrolide antibiotics used in this study. A group of 60 healthy patients aged 18 to 65 years were administered with the antibiotics for the prevention of post dental extraction bacteremia. An in vitro blood culture system was used which contained the isolated streptococci. Minimum inhibitory concentrations of erythromycin and josamycin for each isolate was estimated by an agar dilution technique, with controls. Levels of drug in the serum of volunteers and of patients were assayed after oral doses of macrolide antibiotics. The levels found achieved early peaks and satisfactory concentrations for activity against streptococci .Within specified parameters, the results demonstrated that the antibiotics failed to prevent survival in blood culture of various strains of streptococci for upto 24hrs following collection of blood. It was recommended that an alternative antibiotic to either

erythromycin or josamycin be used to achieve prophylaxis against streptococci in infective endocarditis risk patients who are allergic to penicillin.

Hallett KB, Radford DJ et al (1992)²¹ investigated the Oral health of 39 children with congenital cardiac diseases. 33 healthy control siblings were included and showed that CCD children generally suffered poorer oral health with more untreated decay and endodontically treated teeth and 52% of CCD children had enamel hypoplasia compared with only 23% in the control group. Children with CCD also had less than optimal professional and home dental care. Only 31% had professional advice regarding increased preventive dental health behavior, and only 15% used fluoride supplements, although the children resided in a nonfluoridated area. Furthermore they found that significantly fewer CCD children had parental help with tooth brushing compared to control children. It was recommended that children with CCD should be targeted for vigorous preventive dental care.

Duffin R, Pallister L et al (1992)¹⁴ assessed the dental care provided to patients susceptible to infective endocarditis by a survey of 2554 patients in Belfast and 2783 patients in Glasgow. A questionnaire was devised to be completed by consecutive patients attending each of the dental speciality clinics of the school of dentistry, Belfast and the general hospital and school, Glasgow. The sample of patients was assumed to be reasonably representative of the population at large. In respect to antibiotic cover for dental and surgical procedures for patients susceptible to infective endocarditis, the study checked

whether adequate precautions had been taken by the patient's medical and dental advisors. The results of the study showed that patients at risk of infective endocarditis were receiving antibiotic cover for dental and surgical procedures. It was concluded that there is still room for improvement in the advice given to patients and medical and dental practitioners.

Stefano FD, Robert F et al (1993)⁴⁷ conducted a study to assess dental disease and risk of coronary heart disease and mortality. It was done to investigate a reported association between dental disease and risk of coronary heart disease. It was done among a national sample of American adults who participated in a health examination survey in the early 1970s. Data from national health and nutrition examination study and its epidemiological follow up study was studied. 20749 subjects were studied initially from 1971 to 1974. Follow up study was restricted to participants in age group of 24 to 75 and was done for 14 years. A standardized dental examination was done on this group which included number of decayed permanent teeth, Periodontal classification, periodontal index, oral hygiene index. It was found that those who had periodontal disease had 25% increased risk of coronary heart disease than those without it. Poor oral hygiene with presence of dental debris and calculus was also found to cause increase in coronary heart disease. It was found that dental disease is associated with an increased risk of coronary heart disease, particularly in men.

Cetta F, Bell TJ et al (1993)⁸ studied the parental knowledge of bacterial endocarditis prophylaxis.. Parents of 135 patients attending a pediatric cardiology clinic in a university centre were mailed an eight-question survey pertaining to their knowledge of their child's cardiac disease and medications. Eighty-four (62%) parents returned complete surveys. The patients' mean age was 5 years with a range of 9 weeks to 19 years. It was observed that eighty-two (98%) respondents were high school graduates. Fifty-two (62%) respondents correctly defined endocarditis. Eighty-two (98%) parents knew the correct name of their child's cardiac condition and 27/32 (84%) knew the names of their child's current medications. It was found that only 36/64 (56%) parents of at-risk children knew measures to prevent endocarditis. While most parents know the name of their child's heart lesion and current medications, parental knowledge of endocarditis was limited. It was concluded that intensified education and awareness programs are needed in order to prevent potential major morbidity and mortality for pediatric patients with heart disease.

Franco E, Saunders CP et al (1996)¹⁶ conducted an epidemiological and microbial survey and determined the levels of dental caries, caries related microflora and salivary IgA in 60 children with severe congenital cardiac disease from the cardiac units of the hospital for sick children and compared with 60 case matched control children from the department of orthodontics and paediatric dentistry, guys dental school, London by using the WHO

criteria 1997. It was found that there was similar levels of caries both in the cardiac (3.9 and 2.7) and the control(3.7 and 2.0) group with significantly greater amount of untreated caries. It was concluded that high bacterial loading associated with high levels of bacterial dental plaque and gingivitis may put cardiac patient at unnecessary risk of developing bacterial endocarditis.

Droz D, Koch L et al (1997)¹³ conducted a study to analyse the dental risk factors for infective endocarditis. The study was conducted for a period of 22 years. It was carried out in the department of Paediatric cardiology in Nancy, France. 43 children were assessed during the time period of 1970 to 1992 and 45 episodes of infective endocarditis were recorded. Congenital cardiac disease was found to be the most frequent predisposing factor for infective endocarditis. The causes of bacteraemia found were frequently but not exclusively of dental origin (30.5%). The dental causes found were poor oral health, inappropriate treatments and lack of antibiotic prophylaxis. It was concluded that children diagnosed with a cardiac disorder should be examined by a dentist. Modern principles of antibiotic therapy and accepted dental procedures must be performed as soon as possible and parents must be informed of current preventive recommendations.

Hujoel P, Drangsholt M et al (2001)²³ examined the link between coronary heart disease and the elimination of chronic dental infections. It was suggested that the periodontal disease may be associated with coronary heart

disease, though there were no data suggesting that the elimination of chronic dental infections actually lowers the risk of developing chronic coronary heart disease. The study determined whether people with a definitive elimination of all potential dental infections, from a coronary heart disease perspective-lowers their CHD overtime when compared with people who have a specific dental infection, periodontitis. The data of a prospective cohort of 4027 people who participated in the first national health and nutrition examination were analysed. The primary outcome measure was the first CHD event. It was found that the confirmed elimination of chronic dental infections did not lead to a decreased risk of experiencing a CHD event. The CHD risk of people with or without chronic dental infection remain constant over time with respect to each other. It was concluded that the people who had a complete definitive and long term elimination of all potential dental infections through extractions of all teeth did not have lower CHD risk when compared to people diagnosed with periodontitis.

Genco R, Offenbacher S (2002)¹⁸ et al studied the association of periodontal and cardiovascular disease. It was found that a studies conducted by Arbes and colleagues reported that periodontal disease was associated with cardiovascular disease. The longitudinal studies by joshipura and colleagues were summarized and reported to date, as they represent the highest level of evidence available regarding the connection between periodontal disease and heart disease. Many case control and cross- sectional studies were reviewed

and it was found that there was a moderate relationship between periodontal and heart disease. Some case control studies also showed that subgingival periodontal pathogenic infection may be associated with myocardial infarction. In basic laboratory studies it was proved that oral bacteria have been found in carotid atheromas and were also associated with platelet aggregation, an event important for thrombosis. Animal studies showed that atheroma formation can be enhanced by exposure to periodontal pathogens. With the accumulation of the epidemiologic, invitro, clinical and animal evidence it was concluded that periodontal infection may be a contributing risk factor for heart disease.

Da Silva, Souza IP et al (2002)⁹ assessed the knowledge, attitudes and status of oral health in children at risk for infective endocarditis. oral examination was carried out in 104 children(2-17yrs of age) at risk for infective endocarditis attending the paediatric cardiology service, rio de janeiro, brazil. A structured interview was carried out with the guardians and oral examination on each child to determine scores for the plaque index, gingival index and dmft/DMFT index. It was found that the 9.6 %of guardians who understood the meaning of heart infection was , 60.6% who knew the possibility caused by dental procedure,72.1% who understood the requirement of antibiotic cover before dental treatment and 41.3% who understood the importance of good oral health to prevent infective endocarditis, 46.1% of children brushed their teeth 3 times or more a day,

28.8% had never visited a dentist before and only 24.3% attended the dentist for prevention. It was evident that there was a visible plaque in 98% and gingival bleeding in 99% of the children in this study. It was also found that the mean caries experience for primary dentition was 2.62 and for permanent dentition was 3.97. It was concluded that the guardians knowledge and attitude about oral health was poor and the children's oral hygiene was significantly poor.

Balmer R, BuLock FA et al (2003)³ studied the experiences with oral health and dental prevention of children with congenital heart disease. Questionnaires were distributed to the families of 38 children under the care of paediatric cardiology. A short dental examination was carried out. Parents were asked if they knew why oral health was of particular importance in their child. Of the children, 58% demonstrated evidence of previous or current dental disease, with 24% having had at least one filling, 13% with one or more teeth showing deficiency of enamel, and 39% with untreated dental caries. Only 79% of the children were registered with a dentist. According to Chi squared test, there was no difference in the dental health of registered and non registered children. Of the study group, 29% had received instruction in oral hygiene, 42% had received dietary advice, 13% had received advice regarding fluoride supplementation or had fluoride professionally applied, and 8% had fissure sealants. It was also found that only 64% of parents were aware of the link between the oral health of their children and infective

endocarditis. Parents of children who were registered were more likely to be aware of this link than parents of children who were not registered. It was also observed that in spite of being registered with general dental practitioners, few children with congenital heart disease had received basic education in dental hygiene. Even children known to have had dental disease and, therefore, considered to be more vulnerable, were overlooked.

Bulat DC, Kantoch MJ et al (2003)⁶ studied about how much do parents know about their children's heart condition and prophylaxis against endocarditis. Parents of 65 consecutive children with heart disease, aged from two months to 16 years, were asked to complete a survey while awaiting their ambulatory appointment. On average, patients had been seen by 1-7 cardiologists and had attended 7-8 clinic appointments before the study, with 55% having undergone heart surgery and 18% currently taking cardiac medications. In general, caregivers felt they had received full explanation of their child's condition (89%) and were informed sufficiently about ongoing care (91%), yet only 71% knew the specific name of their child's heart defect, with 65% being able to correctly explain the condition in layman's terms. Of the 55 children whose heart defects fulfilled risk criteria for BE, only 47% of their parents declared to have ever heard of the disease, with just 25% able to correctly define it. Although 71% of the children's parents knew that special medication was required when seeing a dentist, only 29% were aware of any other situations when they would also require it. As many as 27% of the

children who required BE prophylaxis had significant dental problems in the past, including root canals, extracted teeth, braces, caps and gingivitis. It was found that many parents are not familiar with their child's heart disease and do not understand the risks of BE or the need for BE prophylaxis. Results of this study indicated the need for continuous education of patients and their parents by physicians, nurses and allied health care provider.

Glick M, Barbara GL et al (2005)¹⁹ conducted a study to identify risk factors for cardiovascular disease. A multidisciplinary approach that includes a cardiovascular screening by oral health care providers can affect the identification of people at risk of experiencing cardiovascular events. The data were extracted from 1999 to 2000 national health and nutrition examination survey (NHANES) and the 2001 to 2002 NHANES for people aged 40 to 85 years with no reported specific risk factors for coronary heart disease (CHD) and who had not seen a physician for the past 12 months but had seen a dentist. These data were used to estimate the 10-year Framingham based risk calculation scores for each subject to determine their global risk of experiencing acute CHD events. Eighteen percent of male subjects had an increased 10-year global risk of experiencing a CHD event, 14.3% had a moderate, above average risk score and an additional 4.3% had a high risk score. Only one female had a risk score greater than 10 percent. When this data was compared with 2000 U.S. census data they found that among men aged 40 to 85 years without

reported risk factors who had not seen a physician but had seen a dentist in the previous 12 months out of 332,262 had a greater than 10 to less than 20 percent risk of experiencing a CHD event and 72,625 had a 20 percent or greater 10-year risk of experiencing a CHD event. It found that dentists can play a key role in identifying people in need of primary prevention strategies for CVD.

Panggabean E, Irsa L et al (2005)³⁹ et al conducted a cross sectional study on children aged 2 to 15 years from April 2002 to December 2003 at the department of child health, Medan to compare the oral hygiene, dental health and oral microorganisms in children with and without CHD. The dental and oral hygiene status was determined with the help of caries index and oral hygiene index. The swabs from the subjects upper first molar were taken and cultured to determine the types of microorganisms present. It was found that there was a significant difference in mean oral hygiene index between the children with and without congenital heart disease. The positive bacterial cultures were more frequent in children with congenital heart disease than in those without. It was concluded that oral dental hygiene in children with congenital heart disease WAS poor relative to that in children without congenital heart disease. It was found that more microorganism growth appears more likely in children with congenital heart disease than in those without.

Naudi B, Mooney G et al (2006)³⁵ did a retrospective study using a audit data collection method to assess the dental health and preventive practices of child patients with congenital heart disease at the Royal Hospital for Sick Children, Glasgow, for 370 paediatric cardiac patients between January 2002 and December 2003 to obtain an insight into these patients' tooth brushing methods, use of fluoride (F), dental attendance and past dental treatment. An oral examination was done to assess the patient's caries experience. 195 subjects aged between 1 and 5 years, 105 were 6 - 11 years and 70 were 12 -16 years of whom 291 (78%) children were registered for dental care, of whom 331 (90%) children brushed their teeth regularly with F-toothpaste. Experience of dental treatment revealed that 132 (36%) children had undergone previous dental treatment. Oral examination showed that out of 370 patients, 236 (64%) had no active caries. The dental health of the cardiac subjects was poor compared with that of Scottish primary school children (5 year-olds) and the 12 year-olds but compared favourably with the 14-year old group. The relationship between caries activity and frequency of tooth brushing was significant ($p < 0.01$) whereas the relationship between caries activity and attendance for dental care was not significant. Investigators recommended that Children with cardiac problems should be identified in early infancy through liaison with medical colleagues and the family offered all the preventive advice and regular dental care necessary to prevent dental disease.

Pertiwi AS , Sasmita IS et al (2006)⁴¹ discussed the oral and dental management in children with tetralogy of fallot along with two clinical case reports. It was found that, tetralogy of fallot was related to fatal complications such as bacterial endocarditis which was related to dental infections. Children with tetralogy of fallot were at a high risk of caries, in primary dentition. These were due to a certain medication for heart disease contains a high concentrate of sugar. On intraoral examination, it was found that dental caries was present and also the patient had poor oral hygiene. It was concluded that the management of oral and dental conditions is important to prevent bacterial endocarditis.

Agbelusi , Nwhator et al (2007)¹ determined the oral health status of 41 children between the age of 4 months to 14 years with congenital cardiac disease attending the Paediatric Cardiology Clinic of the Lagos University Teaching Hospital between March to July 2003 by using WHO (1997) for caries diagnosis CPITN and Greene and Vermillion criteria for oral hygiene status and gingival health. Four children were edentulous and hence were excluded from the analysis. It was found that 75.7% of these children were caries free but the oral hygiene status of these children was poor (i.e) 14 (38.7%) had gingivitis, 2 (5.4%) had periodontitis and 19 (31.4%) of the children needed scale and polish. They found that the oral health of these children was neglected and needed urgent attention. The investigator emphasized that the children with congenital heart disease should receive

regular preventive and restorative dental care. Parents and caregivers should be educated on the high standard of dental care needed to prevent dental disease and its sequelae, which can be achieved by the collaboration between the dental team and the cardiologist to provide adequate dental care for these children.

Talebi M , Mood M et al (2007)⁴⁸ assessed the oral health status of children with cardiac disease in marshad, iran in the year 2004. A total of 100 patients between the age group of 2-12 yrs with cardiac disease were examined .50 healthy children with the same age group served as the control group. A questionnaire was prepared which contained dental, medical history, dmft, DMFT, debris index, tooth brushing status as well as parental knowledge of infective endocarditis and it was registered for each patient .The results show that there were no significant difference between the case and control groups in dmft and DMFT. It was found that tooth brushing status and debris index were significantly worse in the study.35% of the parents in the study group were aware of the importance of good oral health of children in prevention of cardiac disease .It was concluded that the children with cardiac disease did not have a good oral and dental health status.

Tasioula V, Balmer R et al (2008)⁴⁹ studied the dental health and treatment need and previous dental treatment experience of 146 children of 2 – 16 years of age with congenital heart disease from cardiology out patient department. The study group consisted of 86 CHD children. Sixty healthy

children formed the control group. They found that Mean dmft and DMFT scores were 1.57 (+/- 3.01 SD) and 0.77 (+/- 1.42) for the study group and 1.81 (+/- 3.64) and 0.38 (+/- 1.16) for the control group, respectively. Eight out of 86 CHD children and 5 out of 60 healthy children had enamel defects on their permanent teeth. No significant differences were demonstrated between the 2 groups. The care index for primary teeth was 10% for the study group and 3% for the control group. In permanent dentition, the care index was 30% and 16%, respectively. It was concluded that Children with and without congenital heart disease had similar levels of dental disease. The care index for primary teeth was higher in CHD children, although the overall level was very low.

Daskalov HR, Kitova LV et al (2009)¹¹ investigated how far the risk patient with cardiovascular disorders, receives anadequate anesthesia in the dental treatment. 276 patients from the Clinic of Cardiology – St. Georgy University Hospital, Plovdiv were interviewed. For that purpose a questionnaire was prepared. It comprised questions about retrospective revision of previous dental interventions. The questions were orientated to specify the use of an anesthesia in the dental treatment, how far effective is it, if there is a refusal on the dentist part. It was established, that the doctors of dental medicine avoid the use of anesthesia in the cardiovascular patients.

Rai K, Supriya S et al (2009)⁴² assessed the oral health status of children with congenital heart diseases and awareness, attitude and

knowledge of the parents of 170 children between the age group of 1-16yrs belonging to both genders, with the history of congenital heart disease from Sree Chitra Tirunal Institute of Medical Science and Technology, Thiruvananthapuram and Narayana Hrudayalaya Institute of Medical Sciences, Bangalore. Oral lesions and caries experience were recorded using modified WHO oral health assessment form and found that oral hygiene of the children with congenital heart disease was poor with tongue coating (50.6%), plaque (41.8%), calculus (35.3%), and caries (42.4%). It was noted that the parental awareness on the importance of maintaining good oral hygiene, preventive dentistry, medicinal decay and its systemic effects were very poor. The study recommended that Dentists should give priority to patients whose general health may be put at risk by poor dental health. Close cooperation between Paediatrician, Paediatric Cardiologists and Paediatric Dentists could help in improving dental care for these children.

Fonseca DM, Evans M et al (2009)¹⁵ studied the impact of oral health on the quality of life of young patients with congenital cardiac disease. A standardized questionnaire was given to a sample of parents of 43 children with cardiac disease and 43 healthy controls from 12 to 71 months of age. For every patient, a dental examination was done. Descriptive statistics, the two-tailed t-test, and Fisher's exact test were used for statistical analysis. Of the children with cardiac disease, 17% had caries, compared to 13% of the control group. Almost half of those with cardiac disease had never seen a dentist,

compared to 35% of the control subjects. Of the parents of those with cardiac disease, one-fifth did not know whether oral health was important for the heart, compared to one-tenth of controls. It was also found that insurance and access to care were not barriers to obtain dental treatment. It was observed that, parents of children with congenitally malformed hearts felt more guilty about their child's oral health than control parents, they were more upset about the dental problems and treatments of their children and they thought that dental problems and dental treatment made their children more irritable. The findings indicate that it is of paramount importance that cardiologists and their associated staff educate patients and families about oral health and other issues associated with congenital cardiac disease.

Balmer R, Booras G et al (2010)² studied the oral health of the children considered very high risk for infective endocarditis. The dental health of 28 children considered very high risk for infective endocarditis, with previous infective endocarditis or with prosthetic heart valve between the age of 3-18 were compared with 28 healthy controls between the age of 3-16.. This study also determined the parental awareness regarding the importance of good oral health. The questionnaires were distributed to the parents to assess the awareness of oral health. On clinical examination there was no significant difference in dmft scores of the study and control group (2.43+/-3.72 and 1.36+/-2.5) or in DMFT scores of the study and control group (1.5+/-1.73 and 1.15 +/-1.42),36% of the study group had untreated caries. It was concluded

that there was no significant difference between the oral health of cardiac children and healthy children, although the dmft and DMFT score of the study group was significantly high. Parental knowledge of the link between oral health and infective endocarditis was excellent.

Niwa K, Nakazawa M(2010)³⁷ et al conducted a Japanese national collaboration study in pediatric and adult patients with congenital heart disease and infective endocarditis. 170 children aged 14 days to 17 yrs and 69 adults aged 18-69 yrs who developed infective endocarditis were included in this study. 119 patients including 88 with cyanotic CHD had previous cardiac surgery. Procedures preceding infective endocarditis were dental (12%) followed by cardiovascular surgery (8%). Sites of infection were left sided in 46% and right sided in 51%. Vegetation with diameter 11 mm was documented in 151(63%). The frequent complications were embolic events (stroke 11%, other emboli 20%) and cardiac failure (23%). The most common microorganisms were streptococci (50%) and staphylococci (37%) with methicillin resistant staphococcus aureus in 7.5%. Empirical treatments were penicillins (alone or with other antibiotics 57%) followed by cepheems (22%) and vancomycin (11%). Surgery during active IE was common (26%) with vegetation (45%) and heart failure (29%) as the most frequent indications. Mortality was 8.8% :8.0% among patients who received medical treatment alone and 11.1% among those with active IE who underwent surgery. The causes of death (n= 21) were surgery (7), infection (7), cardiac failure (6) and

renal failure (1). It was found that there was a recent increase of infective endocarditis in pediatric patients with congenital heart disease, along with high mortality and complication rates. It was concluded that a well formulated recommendation for management of infective endocarditis in pediatric and adult patients with congenital heart disease is mandatory.

Oliveira C, Watt R et al (2010)³⁸ studied about the tooth brushing, inflammation and risk of cardiovascular disease. It was examined whether self reported tooth brushing behaviour is associated with cardiovascular disease and markers of inflammation (C reactive protein) and coagulation (fibrinogen). Scottish Health Survey was done which draws a nationally representative sample of the general population living in households in Scotland, to assess the oral hygiene from self reported frequency of tooth brushing and linked the Surveys prospectively to clinical hospital records, and used Cox proportional hazards models to estimate the risk of cardiovascular disease events or death according to oral hygiene. The association between oral hygiene and inflammatory markers and coagulation was examined in a subsample of participants (n=4830) by using general linear models with adjustments. There were a total of 555 cardiovascular disease events over an average of 8.1 (SD 3.4) years of follow-up, of which 170 were fatal. In about 74% (411) of cardiovascular disease events the principal diagnosis was coronary heart disease. It was reported that Participants who reported poor oral hygiene (never/rarely brushed their teeth) had an increased risk of a

cardiovascular disease event (hazard ratio 1.7, 95% confidence interval 1.3 to 2.3; $P < 0.001$) in a fully adjusted model. It was concluded that poor oral hygiene is associated with higher levels of risk of cardiovascular disease and low grade inflammation.

MATERIALS AND METHODS

This cross sectional study was carried out on children with cardiac disease between 3-12 years of age to assess their oral health status.

A total of 300 children between the age of 3 to 12 years with cardiac problems from the outpatient wing of cardiology department at the Institute of Child Health and Hospital for Children, Egmore, Chennai were included in the study. The inclusion and exclusion criteria are given below.

Inclusion criteria

The children who were included in the study were between 3 to 12 years of age with cardiac complications and those at risk of infective endocarditis.

Exclusion criteria

The children with any concomitant disease apart from cardiac disease and those children who were not willing to participate in the survey were excluded from the study.

MATERIALS

Oral examination was done as specified by WHO using the following instruments

- Mouth mirrors
- CPI probes
- Tweezers
- Plastic containers
- Dettol
- Soap
- Cloth
- Tissue papers
- Gauze

METHODOLOGY

The cross sectional study was carried out on children with cardiac disease between 3 to 12 years of age to assess their oral health status. The study was done by Department of Pedodontics and Preventive Dentistry, Ragas Dental College, Chennai in association with Institute Of Child Health and Hospital for Children, Egmore, Chennai

The protocol for this research was approved by the ethical committee of Ragas Dental College and the Institute of Child Health and Hospital for Children, Egmore, Chennai.

A total of 300 children between the age of 3 to 12 years of both the genders with cardiac problems from the outpatient wing of the cardiology department of the Institute of Child Health and Hospital for Children, Egmore, Chennai were included in the study

The survey was conducted between the months of May 2010 and July 2010, following the recommendations of WHO oral health assessment.

- An informed consent was obtained from each parent.(Annexure)
- All the children who participated in the study were examined by a single person and the data was recorded by another person.

The demographics of the patient, parent's monthly income, the familial history, medical history, dental history and parental knowledge about the Childs cardiac disease were recorded through a questionnaire.(annexure)

The questionnaire aimed to obtain information from parents of the children about parental knowledge, attitudes and awareness about the cardiac disease, importance of oral health maintenance and importance of infective

endocarditis prophylaxis as a preventive factor for cardiac disease and their response was recorded.

Patients were examined with a mouth mirror, CPI probe under daylight at the cardiology wing of the Institute of Child Health and Hospital for Children, Egmore, Chennai.

The determination of caries experience (DMFT and deft) for permanent and primary teeth was done following the World Health Organisation (WHO) criteria.⁵²

Caries was recorded by visual examination and by using a CPI probe. Caries was recorded as present when a lesion in a pit and fissure or on a smooth tooth surface has an unmistakable cavity, undermined enamel or a detectably softened floor or wall.

The Simplified oral hygiene index was used to evaluate the oral hygiene status of the patients.

For the primary dentition oral hygiene assessment was done by the Green and Vermillion (OHI-S) index which is modified as done by **Miglani** et al for this study.³² The substituted index teeth were

55 51 65

85 71 75

For the permanent teeth oral hygiene assessment was done by Green and Vermillion (OHI-S) .The index teeth were

16 11 26

46 31 36

For the intra examiner reliability test, 30 patients were re-examined by the same examiner on two consecutive review visits. The reliability of the simplified oral hygiene index, deft and DMFT index was highly favourable, that is about 99.0%

All data from the dental examination and answers to the question were analysed .The results were tabulated and statistical analysis was done by using SPSS for windows statistical software. The proforma is attached to the annexure.

**FIGURE 1 : INSTITUTE OF CHILD HEALTH & HOSPITAL
FOR CHILDREN, EGMORE, CHENNAI**



FIGURE 2 : MATERIALS USED FOR THE SURVEY



RESULTS

A total number of 300 children in the age group of 3 to 12 years with cardiac disease were studied.

Table 1 and Graph 1 shows the age and sex distribution of the subjects. Among the 3-<6 years age group there were 156 males (52%) and 114 females(38%) and in 6-12 years age group there were 19 males(6.3%) and 11 females(3.7%)

Table 2 and Graph 2 shows the diagnosis of cardiac disease and the number of individuals affected by each condition. This includes individuals affected by both congenital and acquired conditions. The various conditions and the individuals affected are given below. About 29% of children are affected by Atrial septal defect, 31.3% of children are affected by Ventricular septal defect, 17.7% of children with Persistent ductus arteriosus, 11.7% of children with Tetralogy of fallot, 4% of children with Atrioventricular septal defect, 0.7% of children with Infective endocarditis, 1% of children with Rheumatic heart disease, 0.7% of children had Acquired congenital myopathy, 1.7% of children had Pyopericardium and 2.2% of children had Constrictive pericarditis.

In Table 3 and Graph 3, Among the 3-<6 years age group, 75.6%(118) of males were caries affected and 24.4%(38) were caries free ,with a mean

deft of 3.73 and 87.7%(100) of females were caries affected and 12.3%(14) were caries free ,with a mean deft of 4.02.The mean deft of 3-< 6 years age group was 3.6.

Among the 6-12 years age group 94.7%(18) of males were caries affected and 5.3%(1) was caries free, with a mean deft of 3.5 and mean DMFT of 1 and 81.8%(9) of females were caries affected and 18.2%(2) were caries free with a mean deft of 2.72 and mean DMFT of 0.36. The mean deft of 6-12 yearss was 3.2 and mean DMFT was 0.76.

There was no statistical difference in the caries experience between primary and mixed dentition groups. **P=0.241(NS)**

Table 4 and Graph 4 shows the Oral hygiene status of the study group children. Among the 3-<6 years age group 37males (13.7%) and 19 females (7.1%) had good oral hygiene. 86 males (31.8%) and 41 females (15.2%) had moderate oral hygiene. It was found that, 33 males (12.2%) and 54 females (20%) had poor oral hygiene.

In the 6-12 age group, 3 males (10%) and 4 females (13.3%) had good oral hygiene. 10 males (33.3%) and 6 females (20%) had moderate oral hygiene and 6 (20%) males and 1 female (3.3%) had a poor oral hygiene.

There was no statistical difference between the oral hygiene status of primary and mixed dentition groups **P=0.633(NS)**

Table 5 and Graph 5a & 5b shows the caries experience of study population according to oral hygiene practices. In the study population 97.3% of children use toothbrush among which 81.2% of children are caries affected, 2.7% of children are finger users among which 100% are caries affected, 97.3% are tooth paste users among which 81.2% are caries affected, 2% are tooth powder users among which 100% are caries affected, 0.7% are coal powder users among which 100% are caries affected. Of the 93.3% are those who brush once daily among which 81.1% are caries affected, 6.7% are those who brush twice daily among which 90% are caries affected and no child brushes more than twice daily.

In Table 6 and Graph 6 it was observed that in the 3-<6 years age group, 87% of the parents were aware about their child's cardiac problem and 13% of the parents were unaware of the cardiac problem

In the 6-12 age group, 86.66% of the parents were aware of their child's cardiac problem and 13.33% of the parents were not aware.

Only 15.83% of parents of the 3-<6 age group were aware of the importance of maintaining the oral health in the prevention of cardiac disease and 84.07% were not aware. In the 6-12 years age group about 16.66% were aware of the importance of maintaining oral health and 83.33% were not aware of it.

Among the 3-<6 age group, 17% of the parents have taken their children to a dentist and 83% of them have never visited a dentist. In the 6-12 years age group 6.7% have visited the dentist and 93.3% have not visited the dentist.

Among the 3-<6 age group, 93% of the parents were not aware of the importance of infective endocarditis prophylaxis, only 7% were aware of it and in the 6-12 age group 93.3% of parents were unaware of the importance of infective endocarditis prophylaxis and 6.7% were aware.

**TABLE 1- DISTRIBUTION OF SUBJECTS ACCORDING TO
AGE AND SEX**

Age in years	Males	Females	Total
3-<6 years	156(52%)	114(38%)	270(90%)
6-12 years	19(6.3%)	11(3.7%)	30(10%)
TOTAL	175(58.3%)	125(41.7%)	300

Table 1 shows the age and sex distribution of the subjects, Among the 3-<6 years age group 52% were males and 38% were females. In the 6-12 years age group 6.3% were males and 3.7% were females

**TABLE 2. DISTRIBUTION OF SUBJECTS ACCORDING TO
DISEASE**

S.NO	DIAGNOSIS	NO .OF.INDIVIDUALS
1	Atrial septal defect	87(29%)
2	Ventricular septal defect	94(31.3%)
3	Persistent ductus arteriosus	53(17.7%)
4	Tetralogy of fallot	35(11.7%)
5	Atrioventricular septal defect	12(4%)
6	Infective endocarditis	20(.7%)
7	Rheumatic heart disease	3(1%)
8	Acquired cardiac myopathy	2(0.7%)
9	Pyopericardium	5(1.7%)
10	Constrictive pericarditis	7(2.2%)

Table 2 shows the disease distribution,29% of the children had atrial septal defect, about 31.3% of children had ventricular defect,17.7% were found to have persistent ductus arteriosus,11.7% of children had tetralogy of fallot,4% of the children had atrioventricular septal defect,0.7% of the children had infective endocarditis ,1% of the children had rheumatic heart disease,0.7% of children had acquired cardiac myopathy,1.7% of the children had pyopericardium, And 2.2% of children had constrictive pericarditis

TABLE 3-CARIES EXPERIENCE OF CHILDREN WITH CARDIAC DISEASE

AGE	S	No of children	ca	cf	deft	DMFT	d	D	e	M	f	F	MEAN deft	MEAN DMFT	P VALUE
3-<6	M	156	118 75.6%	38 24.4%	528	-	451 85.4%		70 13.21%		7 1.32%		3.73	-	P=0.241(NS)
	F	114	100 87.7%	14 12.3%	446	-	377 84.5%		63 14%		6 1.4%		4.02	-	
TOTAL		270	218 80.7%	52 19.3%	974		828 85%		133 13.7%		13 1.3%		3.60		
6-12	M	19	18 94.7%	1 5.3%	66	19	65 98.5%	18 94.7%		-	1 1.5%	1 5.3%	3.47	1	
	F	11	9 81.8%	2 18.2%	30	4	29 96.7%	4 100%	1 3.3%	-	-	-	2.72	0.36	
TOTAL		30	27 90%	3 10%	96	23	94 97.9%	22 95.7%	1 1.05%	-	1 1.05%	1 4.3%	3.2	0.76	

Primary Vs Mixed-P=0.241 (NS)

ca – caries affected; cf – caries free

- In 3-< 6 years age group – 75.6 % of males and 87.7% of females were caries affected , 24.4% of males and 12.3% of females were caries free.
The mean deft of 3-<6 years age group was 3.6
- In 6 - 12 years age group – 94.7 % of males and 81.8% of females were caries affected , 5.3% of males and 18.2% of females were caries free.
The mean deft of 6-12 years age group was 3.2 and mean DMFT was 0.76.
- There was no statistical difference in the caries experience between primary and mixed dentition groups. **P=0.241(NS)**

**TABLE 4 ORAL HYGIENE STATUS OF CHILDREN WITH
CARDIAC DISEASE**

Oral Hygiene Score	Sex	Age in years	
		3 -< 6 years	6 - 12 years
Good	M	37(13.7%)	3(10%)
	F	19(7.1%)	4(13.3%)
Fair	M	86(31.8%)	10(33.3%)
	F	41(15.2%)	6(20%)
Poor	M	33(12.2%)	6(20%)
	F	54(20%)	1(3.3%)
Total		270	30

P=0.633

In table 4, among the 3-<6 years age group examined, 13.7% males and 7.1% females had good oral hygiene, 31.8% males and 15.2% females had fair oral hygiene and 12.2% males and 20% females had poor oral hygiene.

In the 6-12 years age group examined, 10% males and 13.3% females had good oral hygiene. 33.3% males and 20% females had fair oral hygiene and 20% males and 3.3% females had poor oral hygiene.

There was no statistical difference between the oral hygiene status of primary and mixed dentition groups **P=0.633(NS)**

**TABLE 5: CARIES EXPERIENCE OF STUDY POPULATION
ACCORDING TO ORAL HYGIENE PRACTICES**

Oral Hygiene Practices	No. of children		Total
	Caries affected	Caries free	
Tooth brush	237 (81.2%)	55 (18.8%)	292 (97.3%)
Finger	8 (100%)	–	8 (2.7%)
Total	245 (81.7%)	55 (18.3%)	300
Tooth paste	237 (81.2%)	55 (18.8%)	292 (97.3%)
Tooth powder	6 (100%)	–	6 (2%)
Other	2 (100%)	–	2 (0.7%)
Total	245 (81.7%)	55 (18.8%)	300
Once	227 (81.1%)	53 (18.9%)	280 (93.3%)
Twice	18 (90%)	2 (10%)	20 (6.7%)
More than twice	–	–	–
Total	245 (81.7%)	55 (18.8%)	300

	Total	Caries Affected	Caries Free
Tooth brush users	97.3%	81.2%	18.8%
Finger users	2.7%	100%	-
Tooth paste users	97.3%	81.2%	18.8%
Tooth powder users	2%	100%	-
Other	0.7%	100%	-
Frequency – Once	93.3%	81.1%	18.9%
Twice	6.7%	90%	10%
More than Twice	-	-	-

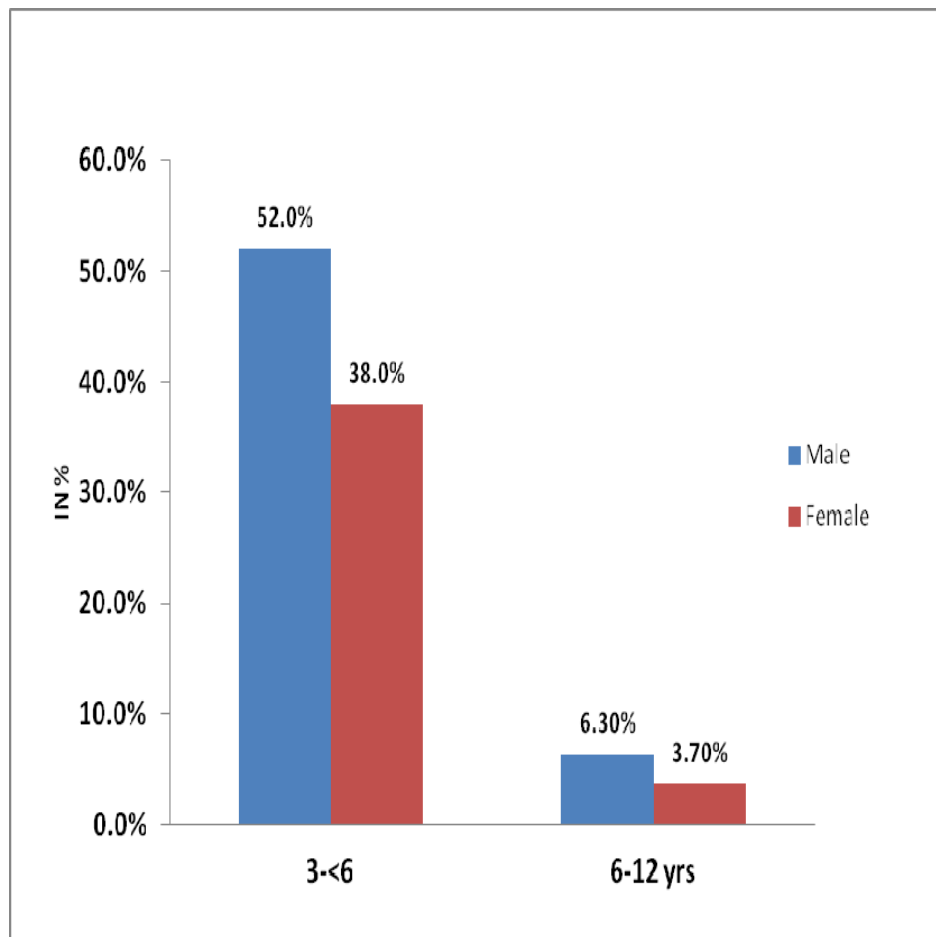
TABLE 6 PARENTAL KNOWLEDGE, ATTITUDE AND AWARENESS ABOUT THE IMPORTANCE OF ORAL HEALTH

Age in years	Awareness of cardiac problem		Importance of maintaining oral health		Importance of infective endocarditis prophylaxis		Have you taken your child to the dentist before	
	Aware	Not aware	Aware	Not aware	Aware	Not aware	Yes	No
3-<6	235 (87%)	35 (13%)	43 (15.83%)	227 (84.07%)	19 (7%)	251 (93%)	46 (17%)	224 (83%)
6-12	26 (86.66%)	4 (13.33%)	5 (16.66%)	225 (83.33%)	2 (6.7%)	28 (93.3%)	2 (6.7%)	28 (93.3%)
Total	261 (87%)	39 (13%)	48 (16%)	252 (84%)	21 (7%)	279 (93%)	48 (16%)	252 (84%)

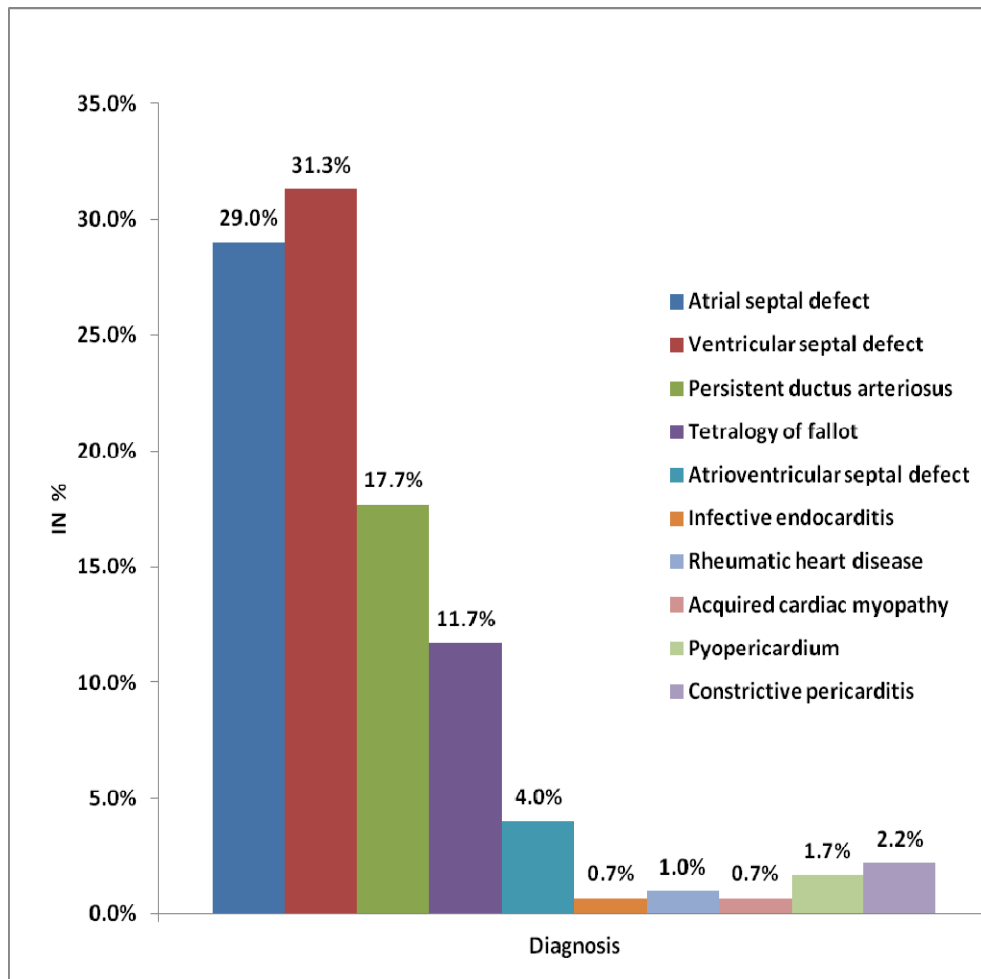
In Table 6, 87% of parents were aware of their child’s cardiac problem and 13% were not aware , 16% were aware of the importance of maintaining oral health and 84% were not aware.

7% of parents were aware of the importance of infective endocarditis prophylaxis and 93% were not aware and about 16% have taken their child to dentist and 84% have not visited the dentist.

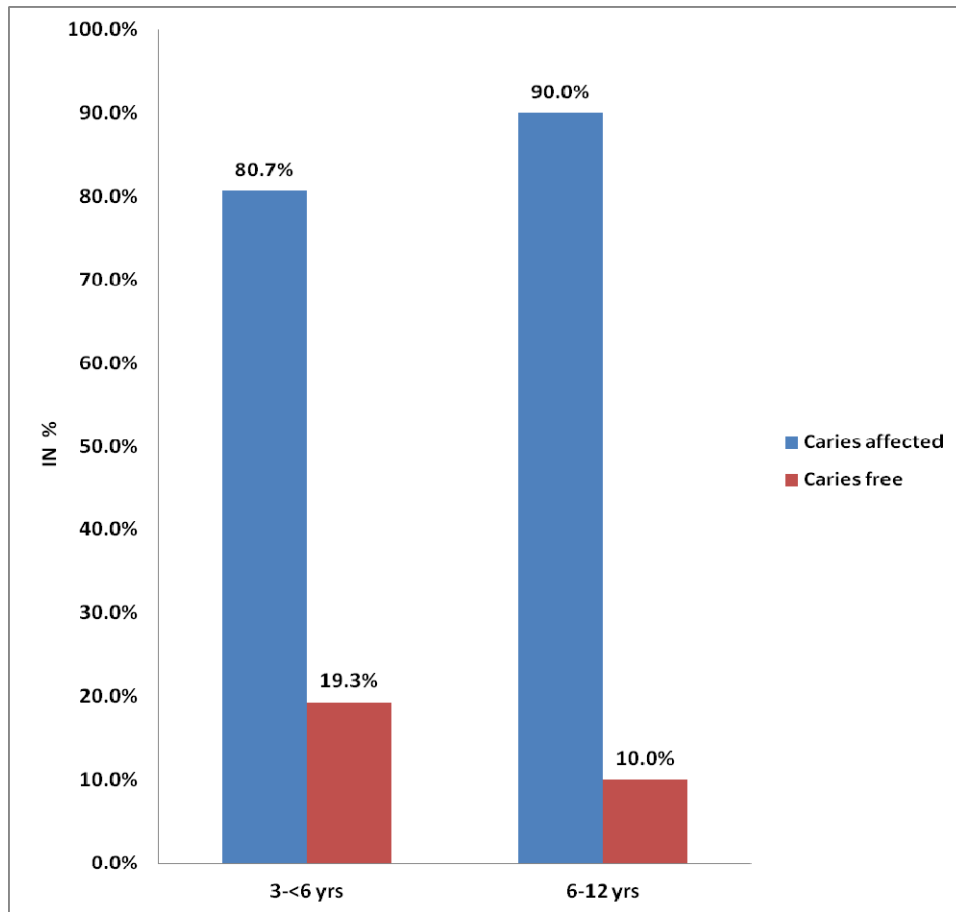
GRAPH 1 : DISTRIBUTION OF SUBJECTS ACCORDING TO AGE AND SEX



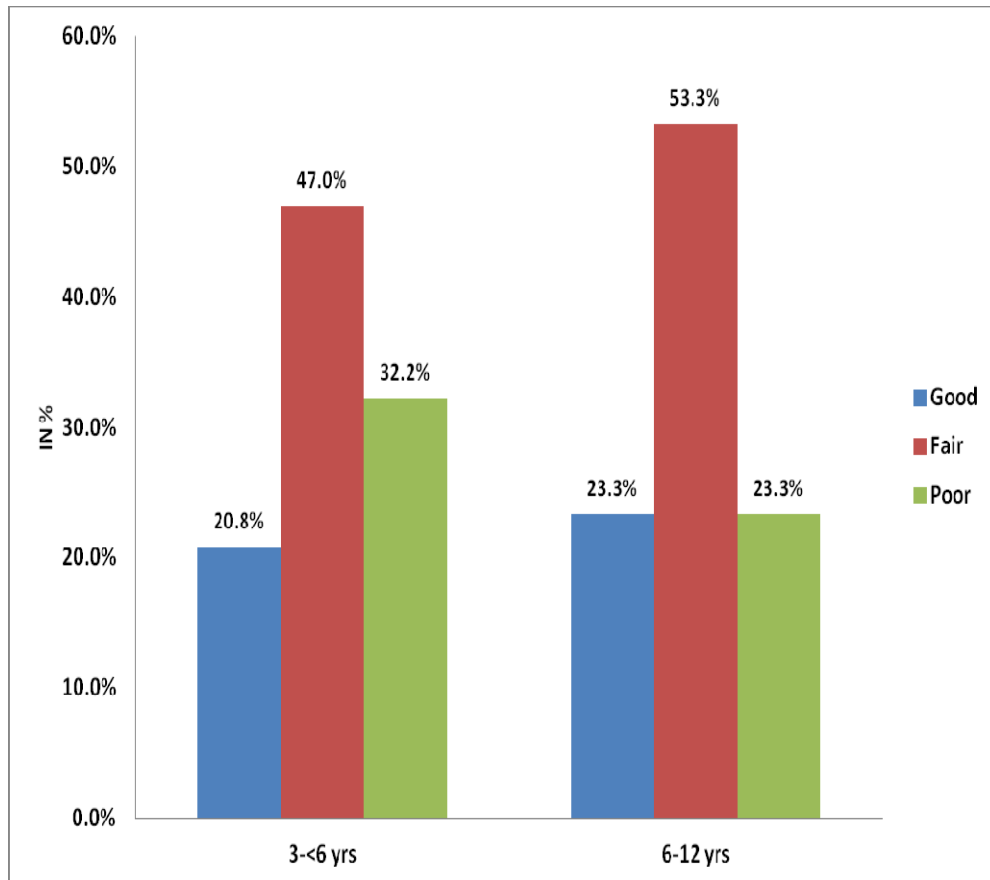
GRAPH 2 : DISTRIBUTION OF SUBJECTS ACCORDING TO DISEASE



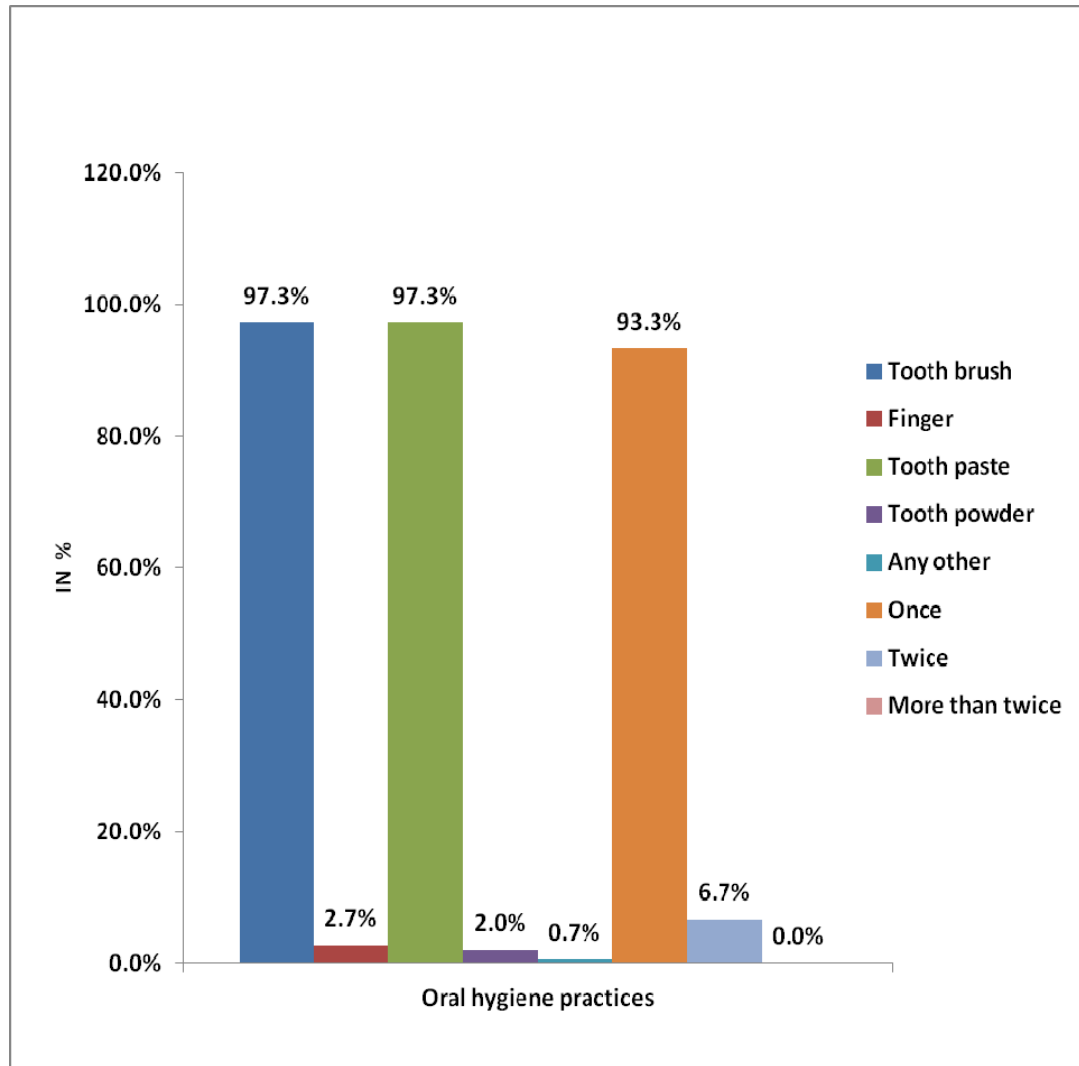
**GRAPH 3 : CARIES EXPERIENCE OF CHILDREN WITH
CARDIAC DISEASE**



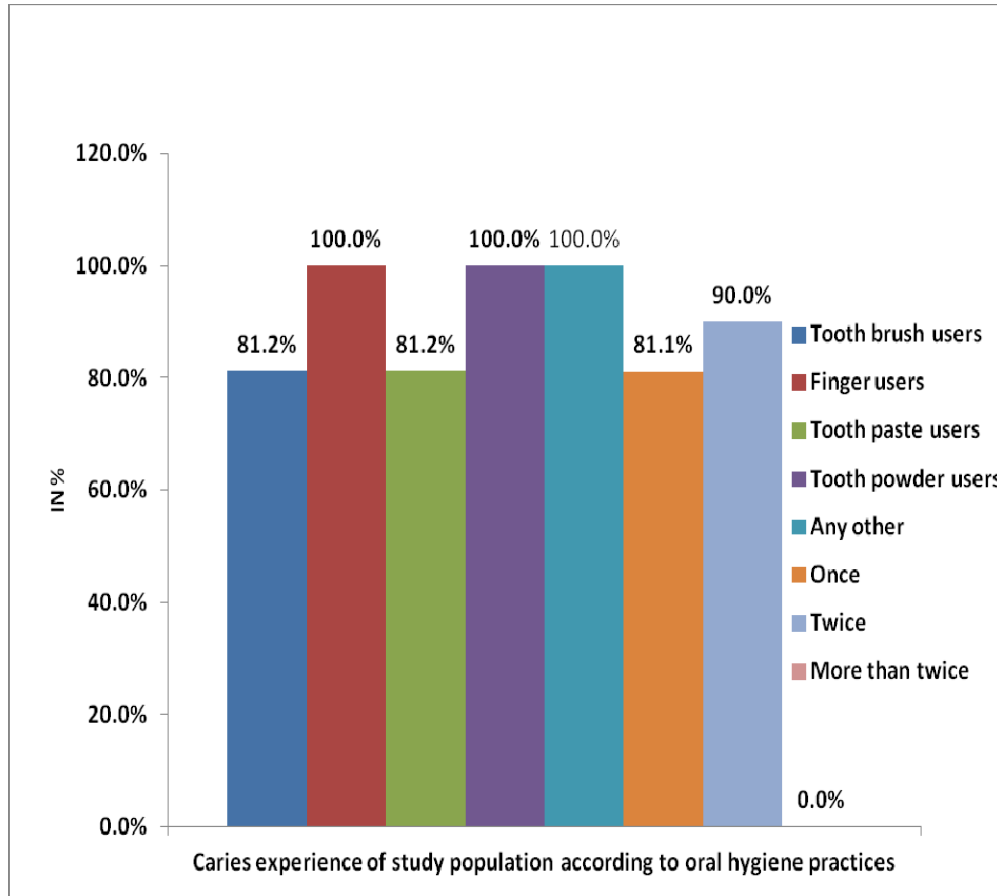
GRAPH 4 : ORAL HYGIENE STATUS OF CHILDREN WITH CARDIAC DISEASE



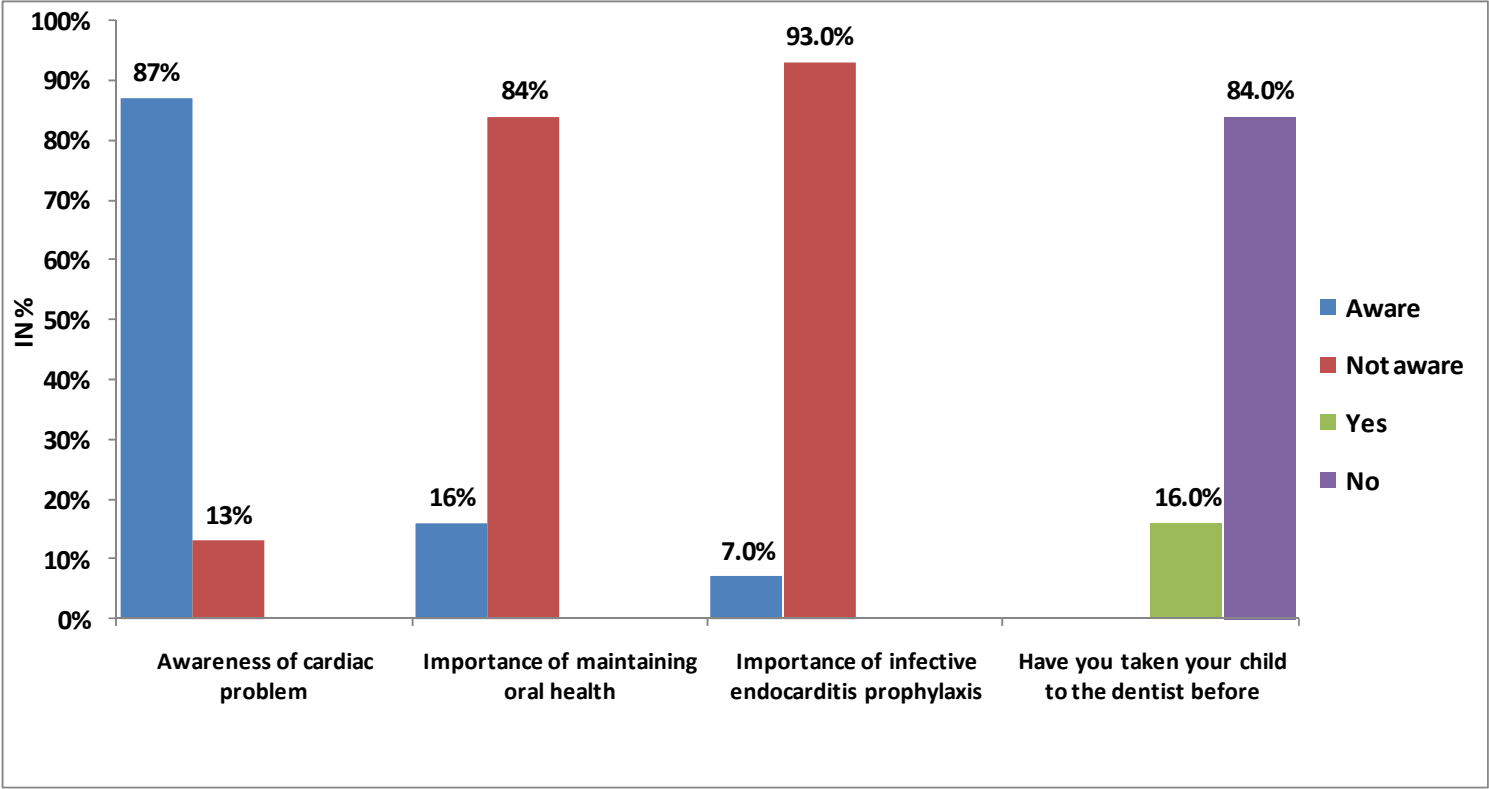
GRAPH 5a : ORAL HYGIENE PRACTICES AMONG STUDY POPULATION



GRAPH 5b : CARIES EXPERIENCE OF STUDY POPULATION ACCORDING TO ORAL HYGIENE PRACTICES



GRAPH 6: PARENTAL KNOWLEDGE, ATTITUDE AND AWARENESS ABOUT IMPORTANCE OF ORAL HEALTH



DISCUSSION

The March of Dimes estimates that over one million children are born with congenital heart disease worldwide, with a ratio of 8:1000 live births.⁴² Source of heart disease in children can be genetic or environmental.⁴⁸ Congenital heart disease in India is likely to be enormous due to a very high birth rate, nearly 180000 children born with congenital heart disease every year.⁴⁶

Children with cardiac disease require special care dentistry because of their susceptibility to infective endocarditis. Families of children with serious heart diseases already face heavy demands due to medication, surgery, recurrent illness and occasional nutritional needs of their children. There is considerable pain and infection in the oral cavity of children afflicted with recurrent problems associated with the underlying cardiac problems.

The awareness for infective endocarditis is very low in India, only 8% of parents were aware and this non-awareness among the majority is due to the illiteracy or ignorance among parents and their low socioeconomic status.³⁴

The patients with cardiac complication also seem to receive less than optimal professional and home dental care. While cardiologists usually advise the parents of children with heart disease to attend their dentist regularly, such advice does not seem to be followed.

Unfortunately, many of these children are found to have poor oral health with high levels of dental caries and untreated gingivitis. The high bacterial loading associated with high levels of bacterial dental plaque and gingivitis may put cardiac patients at unnecessary risk of developing bacterial endocarditis.¹⁶ Dental care in children with Cardiac disease is an important consideration from the time they get their first tooth at which time bacterial colonisation begins. Invasive dental procedure such as extractions, scaling, oral surgery, and endodontic treatment are likely to induce a transient bacteraemia.²⁷ Poor oral hygiene and plaque accumulation are major causes of periodontal disease, which can result in bacteraemia from normal chewing or brushing the teeth.

Martinez et al studied odontogenic infections in the etiology of infective endocarditis. Staphylococci, Streptococci, or Enterococci derived from oral flora was found to be the main causative organisms and antibiotic prophylaxis before dental treatment and maintaining good oral hygiene was recommended.²⁹

Knox et al found that among all the microorganism that cause endocarditis, viridans streptococci represents 50% of all the organisms, the other organisms include Streptococcus sanguis, Streptococcus mitior and Streptococcus mutans.²⁶

It is essentially a challenge for dentists to provide dental care for pediatric patients, whose medical health can be hazardous as a result of poor

dental health. Detailed knowledge of dental and oral conditions of such children is essential when preventive care is to be directed effectively.

Children with cardiac disease require the similar health care maintenance that other children receive. However, there are certain areas that need special consideration in these children such as growth and nutrition, development, immunizations, physical activity, and dental care.

It is well known that prophylactic antibiotics do not guarantee total protection against infective endocarditis where as, the promotion of oral health will be much more effective with scrupulous oral hygiene maintenance and following preventive procedures ,regular dental checkups at every 6-12 months starting from below 1 yr of age.^{4,12} Consequently this information should be emphasized by paediatricians and cardiologists.^{20,24}

Considering all the above factors the present study was done to assess oral health status of children with cardiac disease.

In the present study a total of 300 children between the ages of 3 to 12 years were examined following the inclusion and exclusion criterias at the Institute of Child Health and Hospital for Children, Egmore, Chennai, in the outpatient wing of cardiology department .The children were generally from the low income group as per the parent income records.

The ethical committee approval was got from the review board of Ragas Dental College and the Institute of Child Health and Hospital for Children, Egmore, Chennai. The survey is based on WHO oral health assessment for caries detection and oral hygiene assessment.⁵² It has been modified to assess oral hygiene for children with primary teeth (OHI-S). Caries was recorded following deft and DMFT criteria for primary and permanent teeth. The demographics, parents monthly income, the familial history, medical history, dental history and the parental knowledge about the child's cardiac disease, importance of maintaining oral health, importance of prophylaxis for infective endocarditis and the child's oral hygiene practices were recorded through a questionnaire.(annexure)

Oral examination was done as specified by WHO under daylight with a mouth mirror, a CPI probe at a separate area in the outpatient wing of cardiology department at the institute of child health and research. There were 156 males (52%) and 114 females (38%) in 3 to 6 years age group and 19 males (6.3%) and 11 females (3.7%) in 6-12 years age group.(Table 1)

29%(87) children are affected by Atrial septal defect, 31.3%(94) children are affected by ventricular septal defect,17.7%(53) with persistent ductus arteriosus, 11.7%(35) children with tetralogy of fallot ,4%(12) children with atrioventricular septal defect, 0.7%(2) with infective endocarditis,1%(3) children with rheumatic heart disease,0.7%(2) children had acquired congenital

myopathy,1.7%(5) children had pyopericardium and2.2% (7) children had constrictive pericarditis.(Table 2)

In the present study, in the 3- <6 age group , 218(80.7%) were caries affected and 52(19.3%) were caries free, the mean deft of 3-<6 age group is 3.60.The present study results are in accordance with the study done by **Franco** et al (mean deft 3.7) and **Talebi** et al (mean deft 3.93) and is slightly higher than **Da Silva's** findings (mean deft 2.91).^{16,48,9.}

In the 6-12 years age group, 27(90%) were caries affected and 3(10%) were caries free. The mean deft in the 6-12 yr age group was 3.2 and the mean DMFT was 0.76, which were similar to the findings of **Talebi** et al (mean deft- 3.7, mean DMFT-1.79) and **Franco** et al (mean deft 3.7, mean DMFT 2.7).^{48,16.}

The mean deft for the 6-12 yrs were in accordance with our study and the mean DMFT was higher for this study.

The untreated component (93%) was more in the present study, it requires more attention because it can be a source of infection with increased bacterial load. In the study done by **Balmer and BuLock** et al, 39% of teeth were untreated.³ The severity of caries and the treatment required were not assessed in the study because it was done in a cardiac OP with no facilities for detailed dental examination and this also requires further investigation.

In our study OHI-S was modified for recording debris and calculus score for primary teeth as recommended by **Miglani** et al and followed in studies done by **Amitha Hedge** (2005), and **Mahesh** et al (2005).^{32,44,28} This OHI-S Index was chosen because it is very simple to use. The mean OHI score for children 3- <6 age group showed that 37males (13.7%) and 19 females (7.1%) had a good oral hygiene. About 86 males (31.8%) and 41 females (15.2%) had moderate oral hygiene. It was found that, 33 males (12.2%) and 54 females (20%) had a poor oral hygiene.

In the 6-12 age group, 7males (23.3%) and 4 females (13.4%) had good oral hygiene. 10 males (33.3%) and 7 females (23.3%) had a moderate oral hygiene and 2 males had a poor oral hygiene. These findings were in accordance with **Rai K**(66%) and **Oliveira**(71%).^{42,38} The findings varied from **Das M** et al (87% of children had severe gingivitis) and **Da Silva** et al (98% of children had visible plaque)^{10,9}.

The difference seen in results could be due to variation in evaluation methods and studies were done at different geographic locations where different oral hygiene practices are followed.

In the study population 97.3% of children used toothbrush among which 81.2% of children are caries affected, 2.7% of children are finger users among which 100% are caries affected, 97.3% are tooth paste users among which 81.2% are caries affected, 2% are tooth powder users among which 100% are caries affected, 0.7% are coal powder users among which 100% are

caries affected, 93.3% are those who brush once daily among which 81.1% are caries affected. 6.7% are those who brush twice daily among which 90% are caries affected and no child brushes more than twice daily.

In the present study, even though the oral hygiene practices are good, the caries incidence is relatively high. The probable reasons for the results can be attributed to the multifactorial etiology of dental caries which can be influenced by factors like dietary habits, medication taken, which may contain sugar component²⁷, the immune status of the child and the parents who are usually preoccupied with the child's systemic condition, hence there is a possibility of negligence of the oral health of the child.

In the present study 87% of parents are aware of the cardiac problem in children,⁸ 16% are aware of the importance of maintaining oral health. These findings are similar to **Rai K** et al and **Saunders** et al (85.3% of the parent were not aware of the importance of maintaining oral hygiene).^{42,45} 7% are aware of the importance of infective endocarditis prophylaxis. These findings are in accordance with results of **Nath** et al (8%)³⁴ and only 16% had at least taken their children once to a dentist. These findings are similar to **DaSilva** et al (14%).⁹ This can be due to their illiteracy and also most of the parents belong the low income groups as per records.

The present study findings indicate that the oral health status of children with cardiac disease is poor (85%) are caries affected (27.5%) had poor oral hygiene. The parental knowledge about the importance of

maintaining good oral health (16%) and awareness of infective endocarditis prophylaxis (7%) was poor. The oral health of these children can be improved by educating both parents as well as children by conducting regular awareness programs in cardiac and paediatric wings of hospitals. The pedodontist and the dental team should join gynaecologists, cardiologists, paediatricians, physicians and nutritionists in delivering the best possible care to children with special health care needs and increasing the awareness among parents and patients about the importance of maintaining oral health in the prevention of cardiac complications.

CONCLUSION

Within the limitations of this study,

It can be concluded :

- This study shows that the prevalence of dental caries was high (81.7%) among the cardiac patients with a mean deft of 3.6 and mean DMFT of 0.76
- The study also showed the untreated component (85% in primary and 98% in mixed dentition) of the caries experience was more than the treated component (15% in primary and 2% in mixed dentition).
- 31.33% of children had poor oral hygiene.
- The caries experience is relatively high even though the children's oral hygiene practices are good. The study showed that 97.3% of children were tooth brush users, 97.3% were paste users, 93.3% of children were those who brushed atleast once daily.
- Very few parents were aware of the importance of maintaining oral health (16%) and importance of infective endocarditis prophylaxis (7%) even though most of them were aware of the cardiac problems of children (87%). Attitude towards dentistry among parents was poor. 84% had never taken their child to a dentist.

SUMMARY

The present study was done to assess the oral health status of children with cardiac problems and to determine the parental knowledge about the cardiac disease and the importance of maintaining oral health to prevent cardiac complications with 300 children between the age of 3-12 yrs at Institute of Child Health and Hospital For Children, Egmore, Chennai. Caries and Oral hygiene status was assessed through intra oral examination based on WHO criteria and the awareness was assessed through a questionnaire.

The caries experience in primary and mixed dentition was found to be high (81.7) with mean deft of 3.6 for primary dentition and mean deft of 3.2 and mean DMFT of 0.76 for mixed dentition. Statistical comparison between the two groups was not significant ($P=0.241$).

The oral hygiene status of the children was measured by OHI-S which and 31.3% had poor oral hygiene. The difference between OHI scores of the two groups of children was statistically not significant ($P= .633$).

The oral hygiene practices were found to be good with 97.3% of the children using tooth brush and tooth paste and 93.3% of children brush their teeth atleast once daily.

Also lack of awareness of parents towards Importance of maintaining oral health (84%) and Importance of infective endocarditis prophylaxis (93%) is high.

Closer cooperation between paediatricians, paediatric cardiologists and paediatric dentists can help improve dental care for these children.

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PROFORMA

PATIENT INFORMATION

NAME :

AGE : HEIGHT :

SEX : WEIGHT :

D.O.B :

ADDRESS :

PARENTS OCCUPATION :

FAMILY INCOME :

PARENTAL MEDIAL HISTORY

DO THE PARENTS HAVE ANY CARDIAC PROBLEM :
HAVE THEY BEEN TREATED :

PARENTAL KNOWLEDGE

1. DO YOU KNOW ABOUT YOUR CHILDS CARDIAC PROBLEM
YES / NO
2. DO YOU KNOW THE ASSOCIATION BETWEEN ORAL HEALTH
AND CARDIAC DISEASE
YES / NO
3. HAVE YOU TAKEN YOUR CHILD TO THE DENTIST BEFORE?
YES / NO
IF YES, THE REASON FOR THE VISIT

4. DO YOU KNOW WHAT TO TELL YOUR CHILD'S DENTIST, IF AT ALL HE / SHE HAS TO SEE A DENTIST.

5. ARE YOU AWARE OF INFECTIVE ENDOCARDITIS PROPHYLAXIS FOR YOUR CHILD?

YES / NO

ORAL HYGIENE STATUS

ORAL HYGIENE PRACTICES-FINGER/ BRUSH/ OTHER AIDS

MATERIALS USED – TOOTHPASTE/POWDER/OTHERS

FREQUENCY-ONCE /TWICE/ THRICE/NEVER

HARD TISSUE EXAMINATION

TYPE OF DENTITION :

TEETH PRESENT :

CARIES ASSESSMENT

DMFT, deft

55 54 53 52 51 61 62 63 64 65

deft-

d-decay

e-extracted

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18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

f-filled

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

DMFT

D-DECAY

M-MISSING

F-FILLED

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

85 84 83 82 81 71 72 73 74 75

B. CALCULUS INDEX

1- NO CALCULUS PRESENT

2- SUPRAGINGIVAL CALCULUS COVERING NOT MORE THAN 2/3 OF THE EXPOSED SURFAC

3- SUPRAGINGIVAL CALCULUS COVERING MORE THAN 1/3 BUT NOT MORE THAN 2/3 OF THE EXPOSED TOOTH SURFACE, OR THE PRESENCE OF INDIVIDUAL FLECKS OF SUBGINGIVAL CALCULUS AROUND THE CERVICAL PORTION OF THE TOOTH

4- SUPRAGINGIVAL CALCULUS COVERING MORE THAN 2/3 OF THE EXPOSED TOOTH SURFACE OR A CONTINUOUS HEAVY BAND OF SUBGINGIVAL CALCULUS AROUND THE CERVICAL PORTION OF THE TOOTH

55	51	65	16	11	26
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
85	81	75	46	31	36
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OHI-S=DI-S+CI-S =

GOOD = 0.1-1.2

FAIR = 1.3-3

POOR = 3.1-6

PATIENT CONSENT FORM

I, _____, the parent/ guardian of _____

hereby give consent for the participation of my son/ daughter in the study. I have been informed clearly about the procedure/ techniques of the study and I voluntarily, unconditionally, freely give my consent for the active participation of my son/ daughter without any form of pressure in mentally sound and conscious state.

SIGNATURE OF THE DOCTOR

SIGNATURE OF THE PATIENT'S
PARENT/ GUARDIAN

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