Cardiology in the Young (2013), **23**, 705–710
doi:10.1017/S1047951112001953

Original Article

Comprehensive dental evaluation of children with congenital or acquired heart disease

Kenan Cantekin,[1] Isin Cantekin,[2] Yasemin Torun[3]

[1]*Department of Paediatric Dentistry, Faculty of Dentistry, University of Erciyes, Kayseri;* [2]*Department of Internal Medicine, Faculty of Health Sciences, University of Meliksah, Kayseri;* [3]*Department of Pediatrics, Division of Pediatric Hematology, Kayseri Education and Research Hospital, Kayseri, Turkey*

Abstract *Objective:* The aims of this case–control study were to (a) compare the caries experience and oral hygiene, and (b) quantify the persistence of a delay in the dental age in children with cardiac disease and a group of healthy children. *Methods and Materials:* The study population comprised a group of 268 3- to 16-year-old children and adolescents with a cardiac disease and a group of 268 age- and sex-matched healthy children and adolescents. Specifically, the decayed, missed, and filled teeth indices, simplified oral hygiene index, and the dental ages of the two groups of children were calculated and then compared. *Results:* Although the oral health of the children with either a 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. Dental ages of the children with a congenital heart disease were significantly lower than those of healthy children. The findings showed that complex univentricular heart diseases had the highest negative impact on dental development (−1.1), followed by complex biventricular (−0.9), simple surgical (−0.5), and mild (−0.4) heart disease patients. *Conclusion:* Once thorough knowledge of the child's cardiac status is gained, a definitive dental treatment plan for the child with a cardiac disease can be established.

Keywords: Congenital heart diseases; dental age; oral care; acquired heart diseases

Received: 5 July 2012; Accepted: 10 October 2012; First published online: 20 November 2012

Both dental and cardiac diseases, the latter of which can either be congenital or acquired, can have adverse effects on an individual's quality of life. Although the aetiology of most non-syndromic congenital heart diseases is unknown, it is estimated that approximately eight live-born infants per 1000 live births have a congenital heart disease.[1] Congenital heart diseases in children are often associated with either chromosomal abnormalities or adverse maternal conditions during pregnancy owing to diseases, such as diabetes mellitus; prescription drugs, such as anticonvulsants or anticoagulants; substance abuse, such as alcohol; or infection.[2,3] The aetiology of acquired heart diseases in children is wide ranging, and includes rheumatic heart disease, infective endocarditis, Eisenmenger's syndrome, viral myocarditis, and pericarditis.[2] With improved methods for diagnosing heart diseases in infants, as well as the advances in surgery and anaesthesiology for such infants, the number of surviving children with a congenital heart disease is increasing.[4] Therefore, the oral care of children with a cardiac disease is of great importance for maintaining their quality of life.

Ameloblasts are cells that are sensitive to changes in the intracellular environment.[5–8] Cardiac disease can adversely influence the activity of ameloblasts, and the presence of a cardiac disease in a child at the time of tooth development can result in the formation of defective and soft teeth because of reduced enamel deposition.[9] The oral health of a child with a cardiac disease can also be jeopardised because of other problems, such as difficulties with nutrition in the first few years of his/her life.

Correspondence to: K. Cantekin, Assistant Professor, Department of Paediatric Dentistry, Faculty of Dentistry, University of Erciyes, Kayseri 38390, Turkey. E-mail: k_cantekin@hotmail.com

For example, vomiting is a common problem, and night meals are often necessary in order to maintain energy intake at an acceptable level.[10] Regular dental care is important in children with cardiac disease, and the start of a caries prevention intervention programme in such children is usually delayed. The main reason for this importance and late onset is the long periods of hospitalisation during the first few years of their life. In addition, dentists are reluctant to treat such children.[9]

The simplified oral hygiene index score is a measure of the amount of debris or calculus that is found on pre-selected tooth surfaces. A high simplified oral hygiene index score does not always indicate poor oral hygiene, but can indicate seriously neglected oral health.[11] Tamaki et al[12] investigated the association between periodontal diseases and cardiac diseases in adults and reported that no correlation existed between the simplified oral hygiene index score and the prevalence of cardiac diseases. In their study, Balmer and Bu'Lock[9] reported that 71% of children with congenital heart disease are not educated in oral hygiene.

Delayed eruption of the primary and permanent dentitions has been reported to occur in children with cardiac disease.[13] To date, we were unable to find any published study that informed on the effect of a cardiac disease on dental maturation after a bibliographic search in Medline using PubMed and keywords such as 'congenital heart diseases', 'acquired heart diseases', 'delayed eruption', 'primary teeth', and 'permanent teeth'. Most studies on children with a cardiac disease focused on caries prevalence and determination of the decayed/missing/filled teeth and decayed/missing/filled surface indices.[9,10,14,15] To the best of our knowledge, no studies on the dental health of children with either a congenital heart disease or an acquired heart disease have yet been reported.

In the light of this background, we undertook a case–control study whose aims were to compare the caries experience, oral hygiene, and dental maturation in a group of children with a cardiac disease and a group of healthy children.

Materials and methods

Study design

This retrospective study was conducted by evaluating the dental records of 268 3- to 16-year-old children and adolescents with either a congenital heart disease or an acquired heart disease, who were referred to the Department of Pediatric Dentistry, Faculty of Dentistry, Ataturk and Erciyes University, Turkey, between June, 2004 and February, 2012. Specifically, this study group comprised 165 children and adolescents with a congenital heart disease (8.0 (mean) ± 3.2 years (standard deviation)) and 103 children and adolescents with an acquired heart disease (11.4 (mean) ± 2.7 years (standard deviation)), and did not have any other systemic disease.

The comparison group consisted of 268 healthy children and adolescents, aged 3–16 years (9.4 (mean) ± 3.4 years (standard deviation)), who were recruited from children who presented to the Paediatric Dental Clinic, Faculty of Dentistry, Ataturk and Erciyes University, Turkey, for routine dental check-ups. The healthy children were divided into two groups in such a manner that each group was age and sex matched with the 165 children with a congenital heart disease and 103 children with an acquired heart disease. Children in the control group were excluded from the study if they were receiving active orthodontic therapy or had any systemic disease.

The heart disease patients were further subdivided according to the nature of their heart defect and surgical status. Those with heart disease were categorised into four diagnostic classifications based on the severity of heart disease: (1) mild, (2) simple surgical, (3) complex biventricular, and (4) complex univentricular heart disease. The "mild" category included haemodynamically insignificant forms of congenital and acquired heart lesions, including those that did not require surgical intervention. The "simple surgical" category included conditions requiring a single surgical or interventional procedure. The "complex" groups required repeat surgical operations or repairs (Table 1).

The clinical diagnoses of children with acquired cardiac disease are presented in Table 2.

Data collection

The oral health of each participating child was assessed from the clinical and radiographical records, and images that had been taken by an intraoral camera. All assessments were made by the same investigator (Kenan Cantekin).

Clinical oral health assessment

All dental examinations were performed using a plane dental mirror and blunt dental explorer with the aid of compressed air and proper lighting. The decayed, missing, and filled indices for primary and permanent teeth were calculated according to criteria of the World Health Organization.[16] All caries lesions that involved the enamel – initial caries lesions – and the dentine – manifest caries lesions – were included in the calculation of the decayed, missing, and filled indices. The oral hygiene of each child was measured by the simplified oral

https://doi.org/10.1017/S1047951112001953 Published online by Cambridge University Press

Table 1. Heart disease categories and representative lesions.

Severity of heart disease	Examples
Mild	Abnormal mitral valve
	Aortic root dilation
	Small atrial septal defect/patent
	Kawasaki disease
	Patent ductus arteriosus
	Mild Ebstein's anomaly
	Foramen ovale
	Small ventricular septal defect
Simple surgical	Atrial septal defect
	Ventricular septal defect
	Patent ductus arteriosus
Complex biventricular	Anomalous coronary arteries
	Tetralogy of Fallot
	D-transposition of the great arteries
	Valve replacements/repair
	Aortopulmonary window
	Coarctation of the aorta
	Shone's complex
	Truncus arteriosus
Complex univentricular	Unbalanced complete atrioventricular canal defect
	Pulmonary atresia
	Single ventricle

Table 2. Clinically diagnosed acquired heart disease.

Diagnosis	No.
Rheumatic heart disease	49
Acute	18
Chronic	31
Cardiomegaly with mitral insufficiency	14
Cardiomegaly with mitral stenosis and insufficiency	12
Pericardial effusion with no mitral insufficiency	9
Cardiomyopathy without evidence of MI	14
Endomyocardial fibrosis, predominantly of RV	10
Heart muscle disease	4
Cor pulmonale	2
Pericarditis without effusion, unknown aetiology	1
Myo-pericarditis of the newborn	1
Pyogenic pericarditis (*Staphylococcus aureus*)	1

MI = myocardial infarction; RV = right ventricle

hygiene index. A score of 0.0–0.6 was graded as good oral hygiene, 0.7–1.8 was graded as reasonable oral hygiene, and 1.9–3.0 was graded as poor oral hygiene.[11] At the end of the dental examination, bitewing radiographs were taken in each participating child in order to establish the caries status from the mesial surface of the first premolar or first primary molar to the distal surface of the first or second permanent molar.

Assessment of dental maturation

The dental age of each child was calculated from an orthopantomogram using a radiographic illuminator in a darkened room. The estimation of dental age of all permanent teeth, except that of the third molar, was estimated by the method of Demirjian et al.[17] When a tooth was missing on one side, but present on the contralateral side, the missing tooth was substituted with that on the contralateral side in order to estimate the dental age.[18–20]

Statistical analysis

A one-sample Kolmogorov–Smirnov test was used to test the normality of distribution of the study parameters. An independent-measures t-test was used to compare the decayed, missing, and filled indices scores and dental age of the children with a congenital heart disease, children with an acquired heart disease, and the healthy control groups. One-way analysis of variance was used to compare the all phenomenon for each subdivision group of cardiac patients. The Chi-square test was used to compare the simplified oral hygiene index scores and the various dental treatments of the children with a congenital heart disease and the children with an acquired heart disease with those of the healthy control group. All statistical analyses were performed using a computerised statistical software programme (SPSS version 15.0, SPSS Inc., Chicago, Illinois, United States of America). Statistical significance was set at 5%.

Dental maturation was assessed by the same person (Kenan Cantekin) who was blind to the children's chronological ages. Intra-observer agreement of this measure was determined using the Wilcoxon matched-pairs signed-ranks test by scoring 15 randomly selected radiographs (10%), 30 days after determining the initial score.

Results

Table 3 summarises the oral health of the children with cardiac disease and the healthy children. Although the oral health of the children with either a congenital heart disease or an acquired heart disease was the same as that of the healthy children, as measured by the non-significant differences in the simplified oral hygiene index ($p = 0.71$ and $p = 0.18$, respectively), there were significant differences in the decayed, missing, and filled indices for primary and permanent teeth indices ($p = 0.03$ and $p = 0.04$, respectively).

Dental ages of the children with a congenital heart disease ($p = 0.02$) were significantly lower than those of healthy children. However, dental ages of the children with an acquired heart disease ($p = 0.98$) were the same as those of the healthy children (Table 3).

https://doi.org/10.1017/S1047951112001953 Published online by Cambridge University Press

Table 3. The oral health and ages of the children with a cardiac disease and healthy children.

	CHD group n = 165	Control group of CHD n = 165	p-value	AHD group n = 103	Control group of AHD n = 103	p-value
dmft score	2.8 ± 7.5	1.4 ± 3.7	0.03	2.9 ± 5.8	1.5 ± 4.1	0.04
DMFT score	2.0 ± 2.1	1.1 ± 1.7	0.00	2.4 ± 2.7	1.2 ± 2.1	0.00
OHI-S	1.8 ± 0.6	1.7 ± 0.5	ns	1.7 ± 0.8	1.6 ± 0.6	ns
CA	8.6 ± 3.2	8.6 ± 3.3	ns	11.4 ± 2.7	11.4 ± 2.6	ns
DA	8.8 ± 1.2	9.6 ± 4.5	0.02	12.0 ± 3.0	12.4 ± 2.9	ns

AHD = acquired heart disease; CA = chronological age; CHD = congenital heart disease; DA = dental age; dmft = decayed-missing-filled teeth index for primary teeth; DMFT = decayed-missing-filled teeth index for permanent teeth; ns = non significant; OHI-S = Simplified Oral Hygiene Index
Data are presented as mean ± standard deviation

Table 4. Dental age and oral hygiene assessment based on cardiac diagnosis.

Cardiac diagnosis (n)	DA–CA	p-value	DMFT	p-value	dmft	p-value	OHI-S	p-value
Mild (139)	0.4 ± 0.1	A	1.1 ± 0.7	A	2.9 ± 5.0	A	1.7 ± 0.6	A
Simple surgical (55)	0.5 ± 0.4	A	1.3 ± 0.7	A	2.8 ± 4.4	A	1.8 ± 0.8	A
Complex biventricular (63)	0.9 ± 0.6	B	1.2 ± 0.6	A	3.1 ± 5.9	A	1.7 ± 0.8	A
Complex univentricular (11)	1.1 ± 0.8	B	1.1 ± 0.5	A	3.0 ± 5.7	A	1.7 ± 0.6	A
ANOVA one-way		*		ns		ns		ns

ANOVA = analysis of variance; DA–CA = difference between dental age and chronological age; dmft = decayed-missing-filled teeth index for primary teeth; DMFT = decayed-missing-filled teeth index for permanent teeth; OHI-S = Simplified Oral Hygiene Index
*Significant difference; ns = non-significant difference

Cardiac diagnosis

The findings showed that complex univentricular heart diseases had the highest negative impact on dental development (−1.1), followed by Complex biventricular (−0.9), simple surgical (−0.5), and mild (−0.4) heart disease patients (Table 4). We did not find statistically significant differences between children with simple surgical and mild heart diseases or among children with complex ventricular heart diseases in terms of dental age ($p > 0.05$). However, we found statistically significant differences between children with mild or simple surgical and complex ventricular heart diseases in terms of dental age ($p < 0.05$).

With respect to oral health, we did not find statistically significant differences among children with simple mild, surgical, and complex ventricular heart diseases ($p > 0.05$).

The Wilcoxon matched-pairs signed score of the intra-examiner agreement of dental age was 0.96.

Discussion

The oral health of children with cardiac disease is often neglected because of long periods of hospitalisation when they are young,[9,10,21–23] and this neglect may affect their general health over time. Therefore, the oral health care of children with cardiac disease should not be neglected because of the long-term consequences. There are several published studies on the oral health of children with cardiac disease, and most focused on children with a congenital heart disease. These studies relied on information that was obtained from (a) questionnaires that enquired on the effects of oral health on their quality of life[9,24–27] and/or (b) an oral examination in a cardiology outpatient clinic in which a dental care index,[14] the level of oral hygiene,[9,22,26,28] the decayed, missing, and filled indices for primary and permanent teeth indices,[10,14,21,22,26,28,29] and their needs for dental intervention[26,27,30] were determined. Our study differed from these previous studies in that it assessed the oral health of children with a congenital or an acquired heart disease, but also with regard to study design. Our study was carried out in pediatric dental clinic. Thus, in the present study, the most reliable caries diagnoses and oral hygiene evaluation were concluded. Caries evaluations were performed with clinical examination and intraoral radiographs.

In this study, we found a statistically significant difference in the simplified oral hygiene index of the children with cardiac disease compared with that of the healthy children. This result in accordance with those of Berger[28] who found that the simplified oral hygiene index in children with a congenital heart

https://doi.org/10.1017/S1047951112001953 Published online by Cambridge University Press

disease, who were recruited from a cardiology clinic, was higher than those of children who were hospitalised for <4 days. Da Silva et al[26] assessed the oral health of 104 children in a paediatric cardiology clinic. They found that the oral health of such children was poor, and that they were at risk for developing infective endocarditis. Owing to the fact that their poor oral health could be a source of recurrent bacteraemias, da Silva et al[26] suggested that paediatric cardiologists should provide information about dental care to their patients, as well as their parents or legal guardians.

Our findings on the caries experience are different from those of Tasioula et al[14] and Franco et al,[15] both of whom reported that caries experience in children with a congenital heart disease and healthy children was similar. However, our results are in agreement with those of Hallet et al[21] who found that the caries experience for the primary dentition was significantly higher for children with a congenital heart disease than that of healthy children. The high caries index in children with cardiac disease may be the result of several predisposing factors, such as developmental enamel defects, chronic consumption of sugar-sweetened drugs, high sugar content diets, and parental indulgence.[15,21,28] Urquhart and Blinkhorn[29] also reported that the caries experience was significantly higher in children with a congenital heart disease than that of healthy children for their primary dentition. They proposed that this difference may be due to social background of the children and the frequency and duration of their hospitalisations: the majority of the children with cardiac disease were children of lower social class backgrounds and had spent more time in the hospital's outpatient department than the healthy children. Stecksen-Blicks et al[10] also found that the caries experience for the permanent dentition was significantly higher for children with cardiac disease than that of a group of age- and sex-matched healthy children. They attributed this difference to the repeated intake of digoxin in sucrose-containing syrup. Berger[28] also found that the caries experience was higher in children with a cyanotic heart disease than that of children with an acyanotic heart disease, whose caries experience was higher than that of healthy children. Berger suggested that this higher caries experience in the children with cardiac disease was due to a lower level of dental treatment and care, fewer reminders to brush their teeth, and the consumption of more cariogenic foods at home than the healthy children. Balmer and Bu'Lock[9] suggested that dentists themselves are at fault for the high caries experience in children with a congenital heart disease because they do not devote sufficient time to these patients, the high cost of treating these patients, and their lack of confidence in treating such patients. In their study, Pollard and Curzon[22] found that the caries experience in 5- to 9-year-old children with a congenital heart disease was higher than that of a healthy control group, and suggested that the young age of the children could account for this difference. Collectively, the results of these studies have highlighted that the level of dental care in children with cardiac disease is less than that of healthy children. At least four reasons could account for this difference. First, the socio-economic background of the children with a cardiac disease is often low, and the parents are focused on their child's cardiac disease, and less time is devoted to educating them on oral hygiene and dental care. Second, the parents of children with cardiac disease have not been adequately informed about the importance of oral hygiene and the detrimental effects of dental disease on the quality of life. Third, general dental practitioners are reluctant to treat children with a cardiac disease. Fourth, information on oral care and its importance is not given to children with a cardiac disease and their parents by paediatric cardiologists. This last reason is of considerable importance because children with a cardiac disease have an increased risk of developing infective endocarditis. Therefore, both paediatric dentists and paediatric cardiologists have a huge responsibility for the overall health of their patients, and should be in close communication when evaluating the health of a child with a cardiac disease.

We found that congenital heart disease has a negative impact on dental development, and this finding in accordance with that of White et al,[31] who evaluated the influence of congenital heart disease on bone development. However, children with acquired heart disease do not show such a negative situation. In addition, it is found that complex univentricular heart diseases had the highest negative impact on dental development (−1.1), followed by complex biventricular (−0.9), simple surgical (−0.5), and mild (−0.4) heart disease patients. Owing to the fact that there are no published studies on the relationship between cardiac disease and dental age, the findings of this study require independent confirmation by other investigators using larger study groups.

Study limitation

Although the study population was large and diverse, complex heart disease and surgical patients were underrepresented in the heart disease population, limiting our ability to detect risks among specific subgroups. The history of surgical intervention

appears to be a possible predicator of dental age and oral hygiene. Therefore, further research will be included this phenomenon may be particularly benefit to detect effects among specific subgroups.

Conclusions

The risk of caries in children with a heart disease is potentially high. We found significant differences between the caries experience, the oral health status, and dental age of children with cardiac disease compared with those of healthy children. Once thorough knowledge of the child's cardiac status is gained and any special care requirements are identified, a definitive dental treatment plan for the child with a cardiac disease can then be established. Preventive dentistry in the form of advice on diet and oral hygiene, and home and office fluoride therapy should be provided for all patients. Moreover, these children should receive every appropriate measure in the preventive armamentarium in order to minimise their risk of developing dental caries. Although our data indicate that acquired heart disease in a child does not adversely affect dental development, further studies are needed to investigate the relationships between cardiac disease and dental development in children.

Acknowledgement

The authors thank Dr Mustafa Aydınbelge for excellent assistance in collecting data.

References

1. Baspinar O, Karaaslan S, Oran B, Baysal T, Elmaci AM, Yorulmaz A. Prevalence and distribution of children with congenital heart diseases in the central Anatolian region, Turkey. Turk J Pediatr 2006; 48: 237–243.
2. Welbury RR. Paediatric Dentistry. Oxford, London, 2001.
3. Angus C, Cameron RPW. Handbook of Pediatric Dentistry. Mosby, London, 2003.
4. Rosenkranz ER. Surgery for congenital heart disease. Curr Opin Cardiol 1993; 8: 262–275.
5. Soames J. Oral Pathology. Oxford, London, 1993.
6. Cantekin K, Celikoglu M, Karadas M, Yildirim H, Erdem A. Effects of orthodontic treatment with fixed appliances on oral health status: a comprehensive study. J Dent Sci 2011; 6: 235–238.
7. Cantekin K, Gurbuz T, Demirbuga S, Demirci T, Duruk G. Dental caries and body mass index in a sample of 12-year-old eastern Turkish children. J Dent Sci 2012; 7: 77–80.
8. Karadas M, Cantekin K, Celikoglu M. Effects of orthodontic treatment with a fixed appliance on the caries experience of patients with high and low risk of caries. J Dent Sci 2011; 6: 195–199.
9. Balmer R, Bu'Lock FA. The experiences with oral health and dental prevention of children with congenital heart disease. Cardiol Young 2003; 13: 439–443.
10. Stecksen-Blicks C, Rydberg A, Nyman L, Asplund S, Svanberg C. Dental caries experience in children with congenital heart disease: a case–control study. Int J Paediatr Dent 2004; 14: 94–100.
11. Greene JC. The Oral Hygiene Index – development and uses. J Periodontol 1967; 38 (Suppl): 625–637.
12. Tamaki Y, Nomura Y, Inoue K, Inosita E, Tsurumoto A, Hanada N. Correlation study on oral health and electrocardiogram abnormalities. J Oral Sci 2004; 46: 241–246.
13. Cawson CS. Medical Problems in Dentistry. Butterworth-Heinemann Ltd, London, 2002.
14. Tasioula V, Balmer R, Parsons J. Dental health and treatment in a group of children with congenital heart disease. Pediatr Dent 2008; 30: 323–328.
15. Franco E, Saunders CP, Roberts GJ, Suwanprasit A. Dental disease, caries related microflora and salivary IgA of children with severe congenital cardiac disease: an epidemiological and oral microbial survey. Pediatr Dent 1996; 18: 228–235.
16. World Health Organization. Oral Health Surveys: Basic Methods, 1987.
17. Demirjian A, Goldstein H, Tanner JM. A new system of dental age assessment. Hum Biol 1973; 45: 211–227.
18. Cantekin K, Yilmaz Y, Demirci T, Celikoglu M. Morphologic analysis of third-molar mineralization for eastern Turkish children and youth. J Forensic Sci 2012; 57: 531–534.
19. Celikoglu M, Cantekin K, Ceylan I. Dental age assessment: the applicability of Demirjian method in eastern Turkish children. J Forensic Sci 2011; 56 (Suppl 1): S220–S222.
20. Miloglu O, Celikoglu M, Dane A, Cantekin K, Yilmaz AB. Is the assessment of dental age by the Nolla method valid for eastern Turkish children? J Forensic Sci 2011; 56: 1025–1028.
21. Hallett KB, Radford DJ, Seow WK. Oral health of children with congenital cardiac diseases: a controlled study. Pediatr Dent 1992; 14: 224–230.
22. Pollard MA, Curzon ME. Dental health and salivary Streptococcus mutans levels in a group of children with heart defects. Int J Paediatr Dent 1992; 2: 81–85.
23. Saunders CP, Roberts GJ. Dental attitudes, knowledge, and health practices of parents of children with congenital heart disease. Arch Dis Child 1997; 76: 539–540.
24. Grahn K, Wikstrom S, Nyman L, Rydberg A, Stecksen-Blicks C. Attitudes about dental care among parents whose children suffer from severe congenital heart disease: a case–control study. Int J Paediatr Dent 2006; 16: 231–238.
25. da Fonseca MA, Evans M, Teske D, Thikkurissy S, Amini H. The impact of oral health on the quality of life of young patients with congenital cardiac disease. Cardiol Young 2009; 19: 252–256.
26. da Silva DB, Souza IP, Cunha MC. Knowledge, attitudes and status of oral health in children at risk for infective endocarditis. Int J Paediatr Dent 2002; 12: 124–131.
27. Hayes PA, Fasules J. Dental screening of pediatric cardiac surgical patients. ASDC J Dent Child 2001; 68: 255–258; 228–259.
28. Berger EN. Attitudes and preventive dental health behaviour in children with congenital cardiac disease. Aust Dent J 1978; 23: 87–90.
29. Urquhart AP, Blinkhorn AS. The dental health of children with congenital cardiac disease. Scott Med J 1990; 35: 166–168.
30. Roberts GJ, Holzel HS, Sury MR, Simmons NA, Gardner P, Longhurst P. Dental bacteremia in children. Pediatr Cardiol 1997; 18: 24–27.
31. White RI Jr, Jordan CE, Fischer KC, et al. Delayed skeletal growth and maturation in adolescent congenital heart disease. Invest Radiol 1971; 6: 326–332.