Caries Experience In Patients With Congenital Heart Disease - A Retrospective Study

Trammell M, DDS; Biliciler-Denktas G, MD, FACC; Cardenas A, DDS, MS; Chiquet B, DDS, PhD
[1]Department of Pediatric Dentistry, [2]Department of Pediatric Cardiology, [3]University at Buffalo School of Dental Medicine

ABSTRACT

Purpose: To determine the caries experience of pediatric patients with congenital heart disease (CHD) and to determine if caries experience differs based on cardiac diagnosis, medication use, or concomitant diagnosis of Trisomy 21.

Methods: A retrospective chart review of patients < 12 years old was conducted between 07/01/2011-05/01/2024.Charts were identified were caregivers selected a cardiac diagnosis and were further stratified by (1) those requiring cardiac follow-up (experimental group 1), (2) those also diagnosed with Trisomy 21 (experimental group 2), and (3) those not requiring cardiac follow-up (control group). Data extracted from the medical and dental charts included referral source, cardiac diagnosis, cardiac surgery history, medication use, comorbidities, oral hygiene caries risk assessment, decayed extracted filled teeth (deft) scores, and treatment needs. Student t test, chi-squared tests and fisher exact tests were used, where appropriate, with p-values less than 0.05 considered significant.

Results: 364 patients were included in this study, including 89 in the control group, 234 in experimental group 1, and 41 in experimental group 2. Those requiring cardiac follow-up had a higher cardiac medication use (p<.00001), poorer oral hygiene (p=.004), higher deft scores (p=0.007), and required more treatment under general anesthesia (p<.00001) compared to the other groups. Patients with CHD and Trisomy 21 had scores between experimental group 1 and the control group.

Conclusions: Our findings emphasize the importance of an interdisciplinary collaboration between pediatric dentists and cardiologists to support early preventive dental care and close monitoring for patients requiring medical follow-up

BACKGROUND

- Congenital heart disease (CHD) represents one of the most prevalent birth defects diagnosed in neonates.[1]
- Dental caries is a preventable disease that has potentially life-threatening complications if untreated, especially in immunocompromised patients.[2]
- Patients with special health care needs may have different caries experience than healthy controls; caries experience is different based on the specific healthcare needs of each child.[3]
- Children with CHD may experience a higher caries risk, potentially influenced by different factors like frequent medical interventions, use of medications, dietary and oral hygiene habits, enamel defects.[4]
- A previous study noted that patients with Trisomy 21 with CHD had fewer caries than patients with a CHD without trisomy 21 but still higher than healthy age matched controls. [3]

We hypothesize that patients with congenital heart disease have a higher caries experience than healthy controls and that there will be differences in caries on cardiac diagnosis, medication usage, and concomitant diagnosis of Trisomy 21

METHODS

- This study was approved by the UTHealth Houston Institutional Review Board.
- Patients aged <12 seen in the UT Grad Pediatric Dentistry Clinic for dental exam were identified.
- 600 charts were selected, and the following information was obtained:
  - Age, reason for exam, referral source, cardiac diagnosis, premature/full term, cardiac surgery, cardiac medications, Trisomy 21, other ROS, other Meds, G-tube feeding, Oral hygiene, # Primary teeth, # congenitally missing teeth, enamel defects, deft, treatment recommendation
  - Patients were classified by:
  - Experimental group 1: CHD requiring cardiac follow-up
  - Experimental group 2: CHD and concomitant Trisomy 21
  - Control group: CHD not requiring cardiac follow-up
  - Cardiac diagnoses were confirmed by cardiac consult.
- Data was collected in Microsoft Excel and analyzed using R statistical software (R Core Team 2020)
- Statistical analysis completed. P-values <0.05 considered significant.

RESULTS

- A total of 600 records were reviewed, of which 364 patients met the inclusion criteria, 89 in the control group, 234 in the experimental group 1, and 41 in experimental group 2.
  - Patients with Down syndrome had a significantly higher age at their first dental visit 6.07(p= 0.0049, Table 2).
  - A greater portion of patients with complex congenital heart disease (CHD) were referred by other dentists 23.8% (p=0.005 Table 1).
  - Patients in Experimental Group 1 were prescribed a greater number of cardiac medications compared to the control group 31.1% (p<0.001)
  - Oral hygiene was significantly poorer on patient with complex CHD compared to both the control group and the Down syndrome group 45.1% (p=0.010, Table 2)
  - Caries risk was higher in patients with complex CHD 86.7% (p=0.010)
  - Mean deft were significantly highest in patients with complex CHD 6.17, followed by patients with Down syndrome 4.64 (p=0.0036, Table 2)
  - Similarly, deft % was highest in patients with complex congenital heart disease in comparison 0.35, followed by the Down syndrome group 0.27, with both exceeding the control group 0.22 (p<0.001, Table 2)
  - Experimental group 1 showed the highest proportion of treatment under general anesthesia (54.1%), compared to the Experimental group 2 (33.3%) and the control group (7.9%). In contrast, recall and in-office treatment were more common in the control and Experimental group 2 (p<0.001, Figure 2)

Variable	Category	Control (n=91)	Group 1 (n=273)	p-value
Age (years)	Mean (SD)	5.24 (2.01)	5.19 (2.00)	0.754
Referral Source	No Referral	87.9%	61.5%	
	Cardiologist	1.1%	4.4%	
	Other Dentist	6.6%	23.8%	
	Pediatrician	2.2%	6.2%	0.0005
Surgery History	Surgery	0%	66.7%	<0.001
Cardiac Medication	Yes	1.1%	31.1%	<0.001
SBE Use	Yes	0%	48.0%	<0.001
G-tube History	Yes	1.1%	15.0%	0.0001
Food by Mouth	Yes	100%	94.1%	0.015
Oral Hygiene	Poor	24.2%	44.0%	
	Fair	62.6%	48.7%	
	Good	13.2%	7.3%	0.004
Caries Risk (CRA)	High	73.6%	85.3%	0.0095
deft (# teeth)	Mean (SD)	3.96 (4.29)	5.92 (5.17)	0.0012
deft (%)	Mean (SD)	0.23 (0.25)	0.34 (0.29)	0.0017
Treatment Recommended	OR	8.8%	50.9%	<0.001

Table 1. Experimental group vs Control group.

Variable	Category	Control (n=89)	Group 1 (n=233)	Group 2 (n=42)	p-value
Age (years)	Mean (SD)	5.24 (2.01)	5.19 (2.00)	6.07 (1.60)	0.0049
Referral Source	No Referral	88.8%	61.4%	61.9%	
	Cardiologist	1.1%	4.3%	4.8%	
	Other Dentist	6.7%	24.0%	21.4%	
	Pediatrician	2.2%	6.4%	4.8%	0.0005
Surgery History	Surgery	0%	64.8%	73.8%	<0.001
Cardiac Medication	Yes	1.1%	33.9%	14.3%	0.0005
SBE Use	Yes	0%	48.5%	42.9%	<0.001
G-tube History	Yes	0%	15.5%	14.3%	0.0005
Food by Mouth	Yes	100%	93.6%	97.6%	0.017
Oral Hygiene	Poor	23.6%	45.1%	38.1%	
	Fair	62.9%	47.6%	54.8%	
	Good	13.5%	7.3%	7.1%	0.010
Caries Risk (CRA)	High	73.0%	86.7%	78.6%	0.030
deft (# teeth)	Mean (SD)	3.87 (4.29)	6.17 (5.18)	4.64 (4.88)	0.0036
deft (%)	Mean (SD)	0.22 (0.23)	0.35 (0.29)	0.27 (0.29)	<0.001
Treatment Recommended	OR	7.9%	54.1%	33.3%	<0.001

Table 2. Experimental group vs Experimental group 2 vs Control group.

Figure 1. deft%

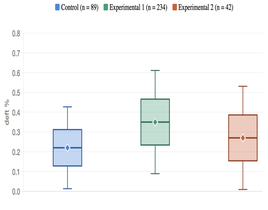
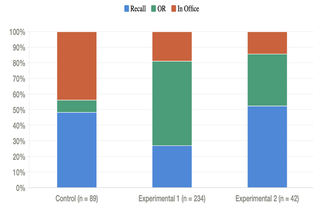


Figure 2. Treatment recommended



CONCLUSIONS

- ***Our findings emphasize the importance of an interdisciplinary collaboration between pediatric dentists and cardiologists to support early preventive dental care and close monitoring for patients requiring medical follow-up***
- **Limitations:** Patients seen by a variety of residents. Data available for review depends on accuracy and detail of patient charts.
- **Further research** should study the barriers to early dental care and the effectiveness of preventive programs in reducing caries risk in and improving oral habits in this high-risk population. Explore multidisciplinary care models.

ACKNOWLEDGEMENTS

This research was supported by Department of Pediatric Dentistry, University of Texas Health Science Center at Houston.

REFERENCES

1. Oral Health Surveillance Report: Trends in Dental Caries and Sealants, Tooth Retention, and Edentulism, United States 1999-2004 to 2011-2016 (Centers for Disease Control and Prevention) (2019)
2. CDC. Congenital Heart Defects (CHDs). 2025 [cited 2026 Jan 19]. Data and Statistics. Available from: https://www.cdc.gov/heart-defects/data/index.html
3. Frank M, Keels MA, Quinonez R, Roberts M, Divaris K. Dental Caries Risk Varies Among Subgroups of Children with Special Health Care Needs. *Pediatric dentistry*. Sep 15, 2019;41(5):378-384.
4. Arikoski E, Sarkola T, Blomqvist M. Dental caries prevalence in children with congenital heart disease – a systematic review. Acta Odontol Scand [Internet]. 2021 Mar 4