ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICINE
DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

DENTAL HEALTH STATUS AND DETERMINANTS IN PEDIATRIC PATIENTS WITH HEART DISEASE: A CROSS-SECTIONAL ANALYSIS AT TIKUR ANBESSA SPECIALIZED HOSPITAL"

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A THESIS SUBMITTED TO THE DEPARTMENT OF PEDIATRICS AND CHILD HEALTH, SCHOOL OF MEDICINE, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR A SPECIALTY CERTIFICATE IN PEDIATRICS AND CHILD HEALTH

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Advisor's Approval Sheet

This serves as confirmation that the thesis entitled "Dental Health Status and Determinants in Pediatric Patients with Heart Disease: A Cross-Sectional Analysis at Tikur Anbessa Specialized Hospital, Addis Abeba, Ethiopia" is submitted in partial completion of prerequisite for the pediatrics and child health specialized certificate at Addis Abeba University collage of health science, school of medicine, département of pediatrics and child health, and has been executed by Dr.Melat Shewabera with our guidance thus, its advised that the student fulfill the prerequisites and submit the thesis to the department as a result,

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Research Project Submission Template

Name of Investigator	Melat Shewabera (MD, pediatric and child health resident)
Name of Advisor	1. Hayat Ahemed, MD Consultant Pediatrician and Pediatric cardiologist,Assistant Professor of Pediatrics and Child Health **Signature:**
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Acronyms and Abbreviations

CHD: Congenital Heart Disease

TASH: Tikur Anbessa Specialized Hospital

KAP: Knowledge, Attitudes, and Practices

dmft: decayed, missing, filled primary teeth

DMFT: decayed, missing, filled permanent teeth

OHI-S: Simplified Oral Hygiene Index

GI: Gingival Index

WHO: World Health Organization

IE: Infective Endocarditis

LMICs: Low- and Middle-Income Countries

Abstract

Background: Children who are born with a cardiac problem are more vulnerable worldwide to poor oral health, which can lead to potentially fatal complications such as infective endocarditis. In Ethiopia, despite limited research, clinical information regarding this susceptible group's oral health is very lacking.

Objective: To assess the magnitude of dental diseases and identify factors associated with them among children with heart disease at TASH.

Methods: A facility-based cross-sectional study will be carried out among a calculated sample of child-parent dyads chosen using a systematic random sampling technique. Data were collected through clinical oral examinations (using dmft/DMFT and GI indices) and structured interviewer-administered questionnaires assessing socio-demographic, medical, and KAP factors. Data were analyzed using STATA/SPSS.

Results: A total of 315 caregivers were involved in the research. The findings showed that 67.0% of children had poor dental status, with gingival inflammation observed in 40.6% and dental caries affecting both primary (44.6%) and permanent teeth (31.2%). Despite over half of the participants reporting access to nearby dental clinics, 93.3% had never visited a dentist, mainly due to lack of referral and low awareness. Most caregivers had poor knowledge (68.3%) and poor oral health practices (97.8%). Multivariable analysis identified caregiver knowledge and child age as significant predictors of dental status.

Conclusion and recommendations: The study demonstrates a high prevalence of poor oral health among children with heart disease, with very low utilization of dental services. Poor caregiver knowledge and lack of referral systems were key contributing factors, indicating a gap between awareness and practice. Strengthening caregiver education, integrating oral health assessment into routine cardiac care, and establishing structured referral systems between cardiology and dental services are essential to improve outcomes.

Key Words Heart disease; Dental disease; oral health; Addis Ababa

1. Introduction

1.1. Background

Globally, the most prevalent congenital defect is congenital heart disease. A comprehensive handbook on the subject reports a global prevalence ranging from 8 to 12 per 1000 live births, with some estimates being as high as approximately 1.8 per 100 live births(1). While advancements in medical care have substantially improved the survival rate of children with congenital heart disease in low and middle-income nations, especially in sub-Saharan Africa, they continue to confront substantial obstacles, including late diagnosis, limited access to specialized cardiac intervention, and a fragmented health care system.

In sub-Saharan Africa, including Ethiopia, CHD significantly impacts public health due to a lack of resources and limited access to specialized care facilities(2). A recent systematic review and meta-analysis found the pooled prevalence of CHD in children and adolescents across Africa to be 3.57 per 1000 live births, with notable regional differences (3). In Ethiopia, although comprehensive national data are scarce, hospital-based studies show that CHD is the primary cause of cardiac illness among pediatric patients at tertiary centers, such as Tikur Anbessa Specialized Hospital (TASH)(4).

Beyond cardiac management, maintaining optimal oral health is particularly crucial for children with congenital heart disease (CHD). The oral cavity acts as a potential entry point for bacteremia, w/c end up in serious complications like infective endocarditis, particularly in children with structural cardiac abnormalities. International evidence demonstrates that children with CHD bear a high burden of dental disease, including caries, gingivitis, and inadequate oral hygiene.(5–8)

1.2. Statement of the Problem

Children with congenital heart disease(CHD) are globally recognized as having increased susceptibility to poor oral health, which can precipitate severe complications like infective endocarditis(5,9). Studies from various countries, including Germany(49.2%), Turkey (71.4%), India (68.8%), and Sudan (64%), have documented high rates of dental caries, gingivitis, and inadequate oral hygiene among this population(7,8,10)

In ethiopia, the situation is likely critical yet remains unquantified. Existing research at TASH has revealed that over 80% of parents and caretakers of children with heart disease have poor knowledge regarding essential oral health practice(11).this substantial knowledge gap strongly suggests a high burden of untreated dental disease among these vulnerable children.

However, there is a complete absence of clinical data quantifying the oral health status of Ethiopian children with CHD. The precise prevalence of dental caries,the degree of oral hygiene neglect and the severity of gingival inflammation within this group remain unknown. This critical gap prevents an accurate understanding of the problems magnitude, its contributing factors and the specific needs of this population.consequently,the lack of targeted intervention or integrated care protocols leaves this medically vulnerable pediatric group exposed to preventable and potentially fata health complication

1.3. Significance of Study

This study holds substantial significance for clinical practice, public health policy, and global health alignment, addressing a severe yet unquantified health risk among the vulnerable pediatric population in Ethiopia. Its importance is multidimensional:

1. Generating foundational evidence and informing practice: this research will provide the first comprehensive clinical baseline data on the oral health status of children with CHD at TASH by quantifying the prevalence of dental caries, plaque accumulation, and gingival inflammation. It transforms speculation into a documented public health priority. Additionally, by identifying key factors associated with poor outcomes, such as cardiac disease type, socioeconomic barrier, and specific parental knowledge gap. The finding will directly inform healthcare providers. This evidence is essential for cardiologists and dentists to develop targeted patient education materials and effective counseling strategies, thereby bridging critical gaps in current clinical practice.

2. Guiding integrated policy and intervention: the study will produce a robust base to advocate for structured, integrated care models. It aims to contribute to the development of targeted interventions that improve health outcomes by highlighting the urgent need to synergize cardiology and dental services. The finding will enable hospital administrators and public health planners to design and implement an integrated oral cardiac pathway, facilitate rational resource allocation, and enhance awareness among caregivers. Ultimately, this will work towards preventing life treating complication such as infective endocarditis and reducing the burden of dental disease among this high-risk group

2. Literature Review

2.1. Magnitude of dental health among children 2 years – 18 years with heart disease

2.1.1. Prevalence of Congenital Heart Disease

Understanding the burden of congenital heart disease (CHD) is essential for contextualizing the significance of the associated conditions like poor oral health. The reported prevalence of CHD varies globally due to difference in diagnostic capabilities, reporting system and study methodologies.

CHD is the most common birth anomaly worldwide. A monumental systematic review by Liu et al(2019), w/c analyzed 260 studies, estimated the global birth prevalence of CHD to be 8.2 per 1000 live birth, indicating millions of affected children are born annually(12) .regional studies provides more specific figure.in China, a large nationwide study reported a prevalence of 3.9 per 1000 live birth(13).in Europe, a germen study reported a birth prevalence of 11.2 per 1000 live births(14), while national data from Saudia Arabia found a prevalence of 5.3 per 1000 live births(15)

The burden in Africa is substantial but likely underestimated due to limited diagnostics. A study in Sudan reported on the pattern of disease among children, noting a high proportion of severe cases (16). Earlier research from Nigeria found that CHD was a common presentation in pediatric cardiology unit, reflecting a significant clinical burden (17).In Ethiopia, precise national birth prevalence data are lacking. However, hospital-based studies reveal the immense clinical burden. A pivotal study at Tikur Anbesa Specialized hospital (TASH) found that congenital heart lesion accounted for 58.5% of case in the pediatric cardiac clinic,establsing it as the leading cause of cardiac disease in children referred to the country main tertiary hospital (4).this figure underscore the sizable and vulnerable population within Ethiopia that is potentially at risk for the oral health complication associated with CHD

2.1.2. Prevalence of Dental Health Problems in Children with CHD

The scientific literature reveals a strong consensus on the poor oral health of children with CHD, although specific prevalence rates show variation across different populations. Overwhelmingly, studies from diverse contexts report that children with CHD suffer from a significantly higher prevalence of dental caries in a near-universal finding, with a high prevalence rate reported in Germany (49.2%), Turkey (71.4%), India (68.8%), and Sudan (64%)(5,10,14). The state of oral hygiene is a major concern, with research consistently showing high plaque and gingivitis scores. A study in Sudan found

that 99% of children with CHD had visible plaque and 97% had gingivitis, while a Turkish study reported 78.9% had poor oral hygiene (8,10).

While the overall trend is consistent, the degree of severity varies, often attributed to cardiac status and socioeconomic factors. Several studies indicate that children with cyanotic heart disease fare worse than those with acyanotic defects due to factors like enamel hypoplasia (18). Furthermore, the mean dmft/DMFT score shows notable variation, from 1.9 in older Sudanese children to 4.31 in an Indian cohort (10,19), reflecting disparities in access to preventive care, dietary habits, and parental education

Despite this global consensus, the precise clinical prevalence of dental disease in Ethiopian children with CHD remains unknown. Existing local studies have focused on parental knowledge, reveling that over 80% of parents/caretakers at Tikur Anbessa Specialized Hospital (TASH) had poor knowledge of oral health care(11,12,20), a key risk factor that strongly suggests a severe underlying clinical problem. Therefore, confirming the clinical prevalence within the unique Ethiopian context is essential to guide public health intervention.

2.2. Factors Affecting Dental Health in Children with CHD

The poor oral health observed in this population results from a complex interplay of medical, socio behavioral, and systemic factors

2.2.1. Biological and Medical Factors

The CHD condition itself creates inherent risks. Cyanosis is a major risk factor for enamel defects(10,18). Prolonged hospitalization disrupts daily routines, pushing oral hygiene aside. Furthermore, dietary recommendations to address failure to thrive often involve cariogenic foods, increasing the caries risk (19).

2.2.2. Socio-Behavioral Factors

Parental knowledge, attitude, and practice (KAP) are pivotal; studies from Ethiopia and India show that parents are primarily focused on the cardiac condition, with limited awareness of the link between oral health and serious systemic complications like infective endocarditis (11). A prevalent misconception is the fear that brushing could harm a child's fragile heart, leading to neglect of hygiene (19).

2.2.3. Systemic and Access-Related Factors

The overarching barrier is the lack of a structured, interdisciplinary care system. Without clear referral pathways from cardiology to dentistry, dental care is overlooked (21). This is compounded by a critical shortage of dentists trained to manage patients with special healthcare needs and the financial burden of treatment (11,19,22)

2.3. Complications of Poor Oral Health in Children with Heart Disease

The consequences of neglecting oral health extend far beyond toothache; they are potentially life-threatening.

- **Infective endocarditis (IE):** is the most feared complication. Bacteremia from routine activities or a dental procedure can allow bacteria to settle on damaged heart valves, causing a severe systemic infection that is difficult to treat and carries a significant risk of mortality (9). Excellent oral health is the primary preventive measure.
- **Impact on cardiac treatment**: Poor oral health can directly impact cardiac care. An active dental infection is a common reason for the postponement or cancellation of essential cardiac surgeries to eliminate the source of potential bacteremia, causing delays in life-saving intervention and worsening the overall cardiac prognosis (9,23)

Dental pain affects a child's ability to eat and sleep, leading to malnutrition and reduced quality of life(24). Chronic oral infections also place an additional inflammatory burden on a body already stressed by a significant cardiac condition (25)

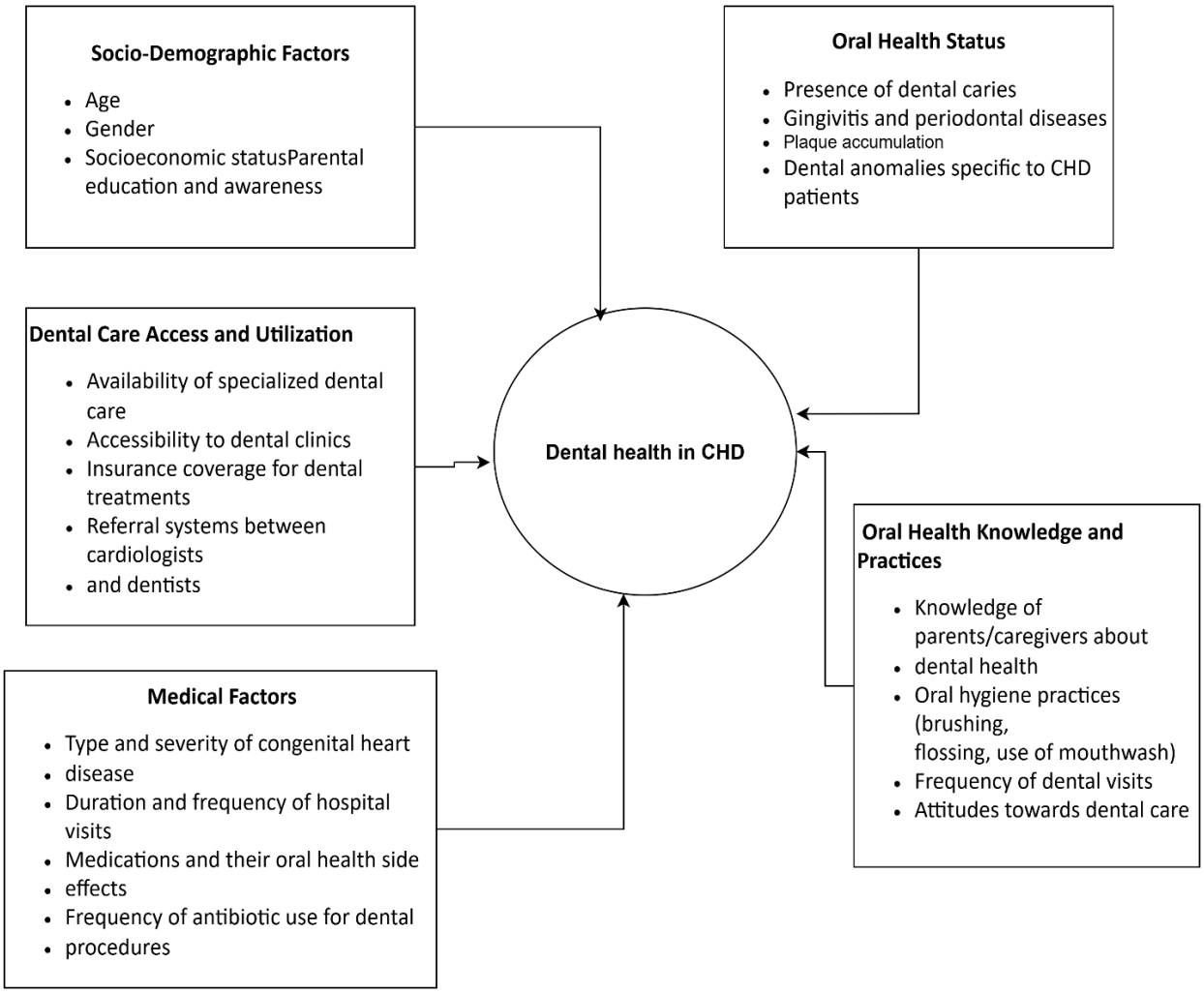


Figure 1: conceptual framework of the status and associated factors of dental health among 2 yrs – 18 yrs children with CHD. Adopted from different studies

2. Objectives

3.1 General Objective

- To evaluate the dental health status and identify the determinants of dental disease among pediatric patients with heart disease at Tikur Anbessa Specialized Hospital, Addis Ababa

3.2. Specific Objectives

1. To estimate the magnitude and severity of dental caries using the dmft/DMFT index.
2. To assess the magnitude of gingival inflammation using the Gingival Index (GI).
3. To evaluate the knowledge, attitudes, and dental hygiene practices (KAP) of primary caregivers regarding their children's dental health.
4. To analyze the sociodemographic and clinical factors associated with poor dental health

4. Methodology

4.1. Study Area

The study was conducted at Black Lion Hospital, also known as Tikur Anbessa Hospital, which is a prominent specialized hospital located in Addis Ababa, Ethiopia. Established in 1964, it serves as a major teaching hospital affiliated with the School of Medicine at Addis Ababa University. The hospital provides a wide range of specialized clinical services and is a key training center for medical students and health professionals from Ethiopia and other African nations. With a diverse team of over 200 doctors, 379 nurses, and 115 other health professionals, supported by a total of 950 administrative staff. TASH is a cornerstone of healthcare in the region, delivering specialized medical services to patients hailing from every corner of the nation. Since its establishment in 1964, the hospital has grown to serve approximately 500,000 outpatients and more than 21,000 inpatients annually, making it the largest referral hospital in Ethiopia.

Its cardiac clinic handles a large number of pediatric patients with congenital and acquired heart diseases, making it a suitable site for recruiting the necessary sample size for this study.

4.2. Study Design

A facility-based cross-sectional study design will be employed, incorporating both quantitative clinical oral examinations and quantitative interviewer-administered questionnaires. This design is appropriate for determining the prevalence of dental diseases and identifying associated factors at a single point in time.

4.3. Study Population

- **Source Population:** All children diagnosed with heart disease and their parents/caretakers attending the cardiac clinic at TASH.
- **Study Population:** All children diagnosed with heart disease and their parents/caretakers who attend the cardiac clinic at TASH during the data collection period and meet the inclusion criteria.

4.4. Eligibility Criteria

- **Inclusion Criteria:**
    - Children aged between 2 and 18 years with a confirmed diagnosis of heart disease.
    - Parents or primary caretakers who are willing to provide written informed consent.

- **Exclusion Criteria:**
    - Children who are critically ill or require emergency cardiac care at the time of data collection.

4.5. Operational and Term Definitions

Child with Congenital Heart Disease (CHD): A child aged 2-18 years with a diagnosis of a structural defect of the heart or intrathoracic great vessels present at birth, confirmed by echocardiography and documented in their medical record at TASH

Dental Caries: the presence of one or more decayed (d/D), missing(m/M) due to caries, or filled tooth surface, as assessed by dmft/DMFT index according to WHO criteria(26)

Good Parental Knowledge: A score above the mean value or median, depending on the distribution of the knowledge section of the KAP questionnaire, indicating a correct understanding of oral health and its relation with CHD (27).

Poor Parental Knowledge: A score equal to or below the mean value on the knowledge section of the KAP questionnaire.(27)

Favorable Attitude: A score above the mean value on the attitude section of the KAP questionnaire, including a positive perception towards the importance of oral health for their child with CHD.(27).

Unfavorable Attitude: A score equal to or below the mean value on the attitude section of the KAP questionnaire. (27).

4.6. Sample Size Determination

- **Sample Size:**

To determine the appropriate sample size for assessing the prevalence of poor dental health among children with heart disease, we used the formula for a single population proportion.

A similar study conducted in Sudan on children with congenital heart defects reported a dental caries prevalence of 64% (p=0.64).(10)

We used the following formula:

$$n_0 = (Z^2 \times p \times (1 - p)) / d^2$$

Where:

Z = 1.96 (standard normal value at 95% confidence)

p = 0.64(estimated prevalence)

d = 0.05 (margin of error)

$n_0 = (1.96^2 \times 0.64 \times (1 - 0.64) / (0.05)^2$

$n_0 = (3.8416 \times 0.64 \times 0.36) / 0.0025$

$n_0 \approx 354$

With finite population correction, since the estimated source population is 4300.

Since the source population (N) is less than 10,000 (N = 4300), we apply the finite population correction formula:

$n = n_0 / (1 + (n_0 - 1)/N)$

$n = 354 / (1 + (353/4300)$

$n \approx 354 / (1.1023)$

$n \approx 327$

To account for a -4% non-response rate:

Final sample size = 327 - 10% of 327 = 327-13 = 315

Thus, the final sample size will be 315 children with congenital heart disease attending follow-up at the cardiac clinic of Tikur Anbessa Specialized Hospital.

4.7. Sampling Technique

A systematic random sampling technique was employed to recruit participants. The sampling frame is the clinic registry list of all eligible children (N=4300). A sampling interval (K) of 14 was calculated by dividing the total population by the sample size (4300/315≈14). The first participant was selected by a simple random method (e.g., a random number between 1 and 14) from the first fourteen eligible children on the list. Then, every 14th person is invited to participate sequentially until the required sample size of 315 is achieved.

4.8. Variables

4.8.1. Dependent Variable

Dental health status (presence of dental caries and gingivitis) as per the DMFT score/GI score.

4.8.2 Independent Variables

Socio-demographic factors: Age, sex, maternal education, income, and residence.

Clinical factors: Type of heart disease, duration of illness, medication history, history of hospitalization,

Oral health behaviors Include Tooth brushing frequency, dental visit history, and dietary habits.

Caregiver awareness: Knowledge about dental care in heart disease, prior health education.

4.9. Data Collection Methods and Tools

Data will be collected through two main methods

4.9.1. Clinical Oral Examination

- **Tool:** A structured clinical examination form based on the World Health Organization (WHO) oral health surveys' basic methods (2013) criteria (28).
- Indices:

A. **Dental Caries: Assessed using the dmft (for primary dentition) DMFT for permanent dentition**

Components:

D / d (Decayed): Number of teeth with untreated dental decay.

M / m (Missing): For permanent (M) teeth, this counts the tooth extracted due to caries

F / f (Filled): Number of teeth with permanent restoration(filling) because of caries.

How to Calculate:

Examine all teeth.

For each tooth, decide if it's sound, Decayed, missing, or filled, and count the total number of teeth in each category.

DMFT=D+M+F

The score for an individual can range from 0 to 28 or 32 (depending on wisdom tooth). A higher score indicates a worse caries experience.

B. Gingival Health: Assessed using the gingival index**.**

Scoring Criteria (0-3) for each tooth surface:

0 = Normal gingiva, no inflammation

1 = Mild inflammation. Slight color change, slight edema, no bleeding on probing

2 = Moderate inflammation, redness, edema, and glazing. bleeding on probing

3= Sever inflammation, marked redness, and edema. ulceration and a tendency to spontaneous bleeding.

How to Calculate:

Examine the gingiva around each of the 6 teeth. The tooth is divided into 4 areas: dentofacial, facial, mesiolabial, and lingual. Score each of the 4 areas. The score for a single tooth is the average of the scores from the 4 areas. The GI for the individual is the average of the scores from all examined teeth.

Interpretation:

0.1 - 1.0 = Mild Gingivitis

1.1 - 2.0 = Moderate Gingivitis

2.1 - 3.0 = Severe Gingivitis

- **Procedure:** Examinations will be conducted by trained dental professionals under artificial light using a plane mouth mirror.

4.9.2. Interviewer-Administered Questionnaire:

- **Tool:** A structured questionnaire will be adapted from previous similar studies, particularly **Habte & Mekasha (2018)** (11) and **Rai et al. (2009)** (21), and contextualized for this study.

4.10. Data processing and Analysis

Once the completeness of the Structured Questionnaire was confirmed, the data underwent a thorough verification and cleaning process to ensure its integrity. Following this step, all valid data were exported into SPSS 25, a statistical software, for detailed analysis.

For the descriptive analysis of continuous variables, results were reported using various statistical measures, including the mean, median, and standard deviation, to provide a comprehensive overview of data distribution. In contrast, categorical data was summarized through frequency counts and percentages, allowing for a clear representation of the different categories.

Binary and multiple logistic regression analyses were employed to identify the association between dental health and socioeconomic, clinical, and KAP of caregiver-related factors. Variables with a p-value < 0.25 in the bivariate analysis were entered into a multivariable logistic regression model to identify independent predictors of poor oral health status, controlling for confounding factors. Odds ratio(OR) with 95% confidence interval (CI) was computed, and A p-value < 0.05 was considered statistically significant. Texts, tables, and figures were used to present the results.

4.11. Data Quality control and management

The data collectors and supervisors were trained for two days on basic data collection and how to collect with a Google Form. The Structured checklists were tested on 5% of the sample at St. Paul Hospital. All data collectors and supervisors participated on pre-testing and standardization of the checklists. Problems highlighted during the pre-test was corrected before the start of the data collection. Each question was properly coded; Continuous supervision was done during pre-test and data collection period by the investigator and supervisors. Completeness and consistency of recording on the checklist sheets were evaluated by supervisors at the end of each working day so that correction measures were taken for the next time.

4.12. Ethical consideration

This research prioritized the ethical treatment of participants through a comprehensive framework aimed at safeguarding their rights and well-being. Ethical clearance was sought from the Ethical Review Committee of the Department of Pediatrics and Child Health.

Upon receipt, an official letter of support and the ethical clearance was submitted to the outpatient coordinator to ensure institutional oversight.

Before engaging in interviews, participants received a clear explanation of the study's purpose, their rights, and the voluntary nature of participation, including the right to withdraw at any time. This information was conveyed in simple, accessible language to enhance understanding. Informed written consent was obtained from the caregivers, and assent was taken from children who are old enough to give.

Confidentiality was maintained by using anonymous codes instead of names and by keeping all data locked and password-protected. Children found to have urgent dental needs were referred to the dental clinic of TASH. All participants received oral health education

4.13. Dissemination and utilization of results

The findings of the study are formally submitted to the Department of Pediatrics and Child Health at Tikur Anbessa Specialized Hospital as a crucial component of the requirements for obtaining a specialty certification in Pediatrics and Child Health. In addition to this submission, they will be disseminated to pertinent governmental and non-governmental organizations, ensuring that the insights gained contribute to broader discussions and initiatives. Furthermore, the study's outcomes will be published in reputable academic journals, enhancing visibility and accessibility for fellow researchers and practitioners. To further promote engagement and collaboration, efforts will also be made to present research at various national and international conferences, fostering dialogue and exchange of ideas in the field.

5 Result

5.1 Socio-Demographic status of caregiver

A total of 315 caregivers of children with congenital heart disease participated in the study. The median age of caregivers was 35 years (IQR: 30–39). The majority of caregivers were aged 25–34 years (132, 41.9%) and 35–44 years (135, 42.9%), while only 16 (5.1%) were aged 24 years or younger and 32 (10.2%) were aged 45 years or above. Female caregivers constituted 205 (65.1%) of the respondents, and mothers were the primary caregivers in most cases (198, 62.9%), followed by fathers (99, 31.4%) and other guardians (18, 5.7%). Regarding educational status, 112 (35.6%) had attained secondary school education, 102 (32.4%) had primary education, and 80 (25.4%) had college or university education, whereas a small proportion had no formal education (18, 5.7%) or postgraduate education (3, 1.0%). In terms of occupation, the majority of caregivers were house-wives (125, 39.7%), followed by private employees (57, 18.1%) and government employees (53, 16.8%). The median monthly household income was 7,000 Ethiopian Birr (IQR: 5,000–10,000), with 122 (38.7%) earning 5,000 Birr or less per month and 112 (35.6%) earning between 5,001 and 10,000 Birr. Most caregivers resided in urban areas (223, 70.8%), while 92 (29.2%) lived in rural settings.

Table 1: Sociodemographic characteristics of Caregivers at TASH form to 2025

		Frequency	Percent
Age of Parents/Caregivers	≤24 years	16	5.1
	25–34 years	132	41.9
	35–44 years	135	42.9
	≥45 years	32	10.2
	Total	315	100.0
Gender of parent/caregiver	Male	110	34.9
	Female	205	65.1
	Total	315	100.0
Relation to the child	Mother	198	62.9
	Father	99	31.4
	Guardian	18	5.7
	Total	315	100.0
Parent/caregiver's education level	No formal Education	18	5.7
	Primary School	102	32.4
	Secondary School	112	35.6
	College/University	80	25.4
	Postgraduate	3	1.0
	Total	315	100.0
Occupation	Unemployed	8	2.5
	Government employee	53	16.8
	Private employee	57	18.1
	Farmer	22	7.0
	Merchant	36	11.4
	Other	14	4.4
	Housewife	125	39.7
	Total	315	100.0
Monthly Income	≤5,000 Birr	122	38.7
	5,001–10,000 Birr	112	35.6
	10,001–15,000 Birr	34	10.8
	>15,000 Birr	47	14.9
	Total	315	100.0
place of residence	Urban	223	70.8
	Rural	92	29.2
	Total	315	100.0

5.2 Medical Factors/Clinical Characteristics

The median age of the children was 5 years (IQR: 3–10), with more than half aged 2–5 years (159, 50.0%), followed by those aged 6–11 years (98, 31.1%) and 12–19 years (58, 18.4%). The sex distribution was nearly equal, with 158 males (50.2%) and 157 females (49.8%). The majority of the children were diagnosed with congenital heart disease (CHD) (290, 92.1%), while 25 (7.9%) had rheumatic heart disease. Among children with CHD (n = 290), most had acyanotic defects (232, 73.7%), whereas 83 (26.3%) had cyanotic heart disease.

The median duration of illness was 4 years (IQR: 2–5), with more than half of the children having lived with the condition for 2–4 years (177, 56.2%), and nearly one-third for five years or longer (98, 31.1%). Regarding healthcare utilization, 89 (28.3%) children had 6–10 hospital visits, 72 (22.9%) had more than 10 visits, and 65 (20.6%) reported 3–5 visits. Regarding current medications, diuretics were the most commonly used (139, 37.7%), followed by no medication (112, 30.4%) and ACE inhibitors (48, 13.0%). Most caregivers reported that their child had never received prophylactic antibiotics (254, 80.6%), and only 6 (1.9%) confirmed prior prophylaxis, while 55 (17.5%) were unsure. A history of infective endocarditis was reported in 30 (9.5%) children. Furthermore, only 102 (32.4%) caregivers reported having received counseling from a physician regarding the relationship between oral health and their child's heart disease.

Table 2: Medical Factors and Clinical Characteristics of the Children at TASH form to 2025

		Frequency	Percent
Child Age	2–5 years	159	50.0
	6–11 years	98	31.1
	12–19 years	58	18.4
	Total	315	100.0
Child sex	Male	158	50.2
	Female	157	49.8
	Total	315	100.0
Diagnosis:	CHD	290	92.1
	RHD	25	7.9
	Total	315	100.0
Type of CHD	A cyanotic	232	73.7
	Cyanotic	83	26.3
	Total	290	100.0
Duration of illness	≤1 year	40	12.7
	2–4 years	177	56.2
	≥5 years	98	31.1
	Total	315	100
Frequency of Hospital Visits	≤2 visits	38	12.1
	3–5 visits	65	20.6
	6–10 visits	89	28.3
	>10 visits	72	22.9
	Many times / not sure	51	16.2
	Total	315	100.0
Medication currently used	No medication	112	30.40%
	ACE inhibitor	48	13.00%
	B Penicillin	19	5.10%
	Diuretics	139	37.70%
	ASA	3	0.80%
	Iron	26	7.00%
	Betablocker	8	2.20%
	Other	14	3.80%
	Total	369	100.00%
Child ever been given prophylactic antibiotics	No	254	80.6
	Yes	6	1.9
	Not sure	55	17.5
	Total	315	100.0
child ever had infective endocarditis	No	285	90.5
	Yes	30	9.5
	Total	315	100.0
Has any doctor talked to you about oral health and your child's heart disease	No	213	67.6
	Yes	102	32.4
	Total	315	100.0

5.3 Dental Care Accessibility and Utilization

The median distance from the hospital was 24 km (IQR: 2–50). Slightly more than half of the caregivers reported having a dental clinic near their home (182, 57.8%). However, 170 (54.0%) indicated that the nearest dental clinic was within 5 km, while 75 (23.8%) reported traveling more than 50 km to access dental services. Regarding affordability, 111 (35.2%) perceived dental services as affordable, 204 (64.8%) considered them unaffordable. Dental insurance coverage was reported by 127 (40.3%) caregivers, while 188 (59.7%) had no coverage. Access to dental appointments was reported as easy by 92 (29.2%) caregivers, difficult by 115 (36.5%), and sometimes easy by 108 (34.3%). Referral pathways and interdisciplinary collaboration were limited, as only 16 (5.1%) caregivers reported that their child had been referred to a dentist by a cardiologist, and only 14 (5.3%) perceived communication between cardiologists and dentists as adequate. Dental service utilization was notably low, with only 12 (3.8%) children having visited a dentist in the preceding 12 months, and 294 (93.3%) having never visited a dentist. The most commonly reported reasons for not visiting a dentist were lack of referral (227 responses, 36.1%), not considering dental care important (160 responses, 25.4%), and high cost of dental services (75 responses, 11.9%).

Table 3: Dental Care Accessibility and utilization at TASH from to 2025

		Frequency	Percent
Dental clinic near your home	No	133	42.2
	Yes	182	57.8
	Total	315	100.0
Distance to nearest dental clinic	≤5 km	170	54.0
	6–20 km	43	13.7
	21–50 km	27	8.6
	>50 km	75	23.8
	Total	315	100.0
dental services affordable	No	204	64.8
	Yes	111	35.2
	Total	315	100.0
dental insurance coverage	No	188	59.7
	Yes	127	40.3
	Total	315	100.0
Referred by a cardiologist to a dentist	No	299	94.9
	Yes	16	5.1
	Total	315	100.0
communication between cardiologists and dentists adequate	No	249	94.7
	Yes	14	5.3
	Total	263	100.0
child visited a dentist in the last 12 months	No	303	96.2
	Yes	12	3.8
	Total	315	100.0
How often does your child visit the dentist	Never	294	93.3
	Occasionally	8	2.5
	Only when in pain	11	3.5
	Regularly	2	0.6
	Total	315	100.0
Reasons for not visiting the dentist	High cost	75	11.90%
	No nearby clinic	62	9.90%
	Long waiting time	23	3.70%
	Lack of transportation	3	0.50%
	Parent fear	49	7.80%
	Not considered important	160	25.40%
	No referral	227	36.10%
	Lack of time	11	1.70%
	No specific reason	19	3.00%
	Total	629	100.00%

5.4 Knowledge, Attitudes & Practices towards Oral Health

5.4.1 Knowledge of caregivers towards Oral Health

Median Knowledge score (IQR) was 5(3,6). Based on Bloom's cut-point classification, 68.3% of parents/caregivers had poor knowledge regarding oral health and 31.7% demonstrated good knowledge.

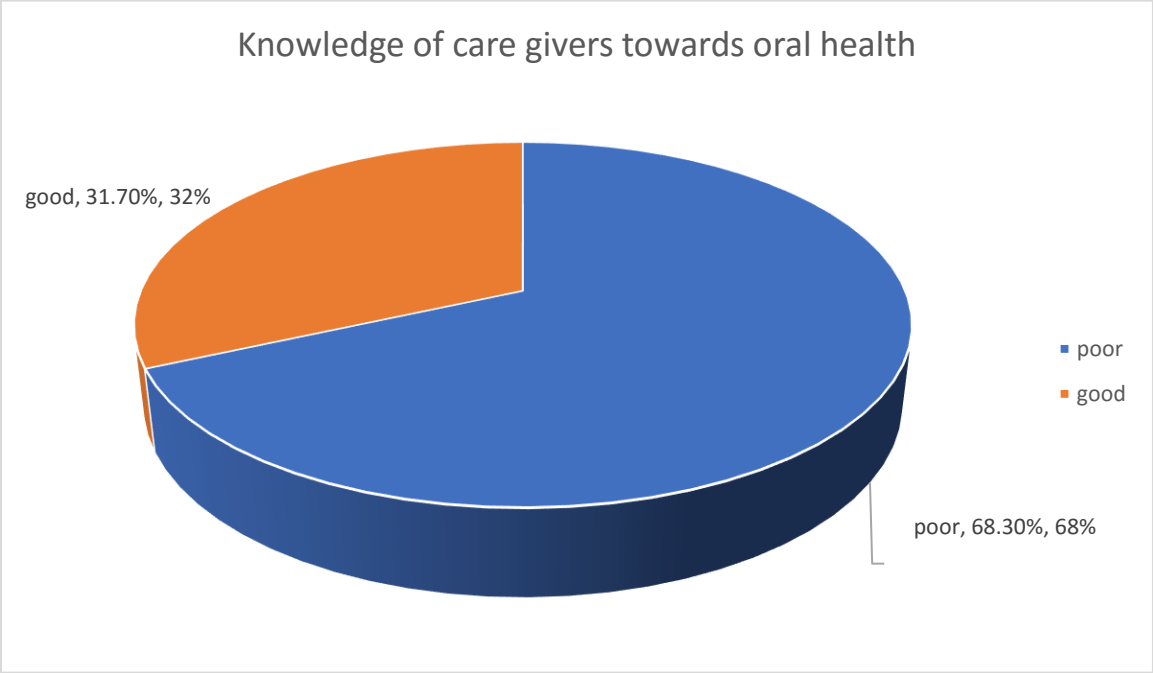


Figure 2 : knowledge of care givers towards oral health

5.4.2 Attitude of Caregiver towards oral health

Median Attitude score (IQR) 26(25,28). Based on Bloom's cut-point classification, the majority of parents/caregivers 218(69.2%) had a moderate attitude toward oral health care for children with congenital heart disease. Nearly one-third 95(30.2%) demonstrated a good attitude, while only 2(0.6%) had a poor attitude.

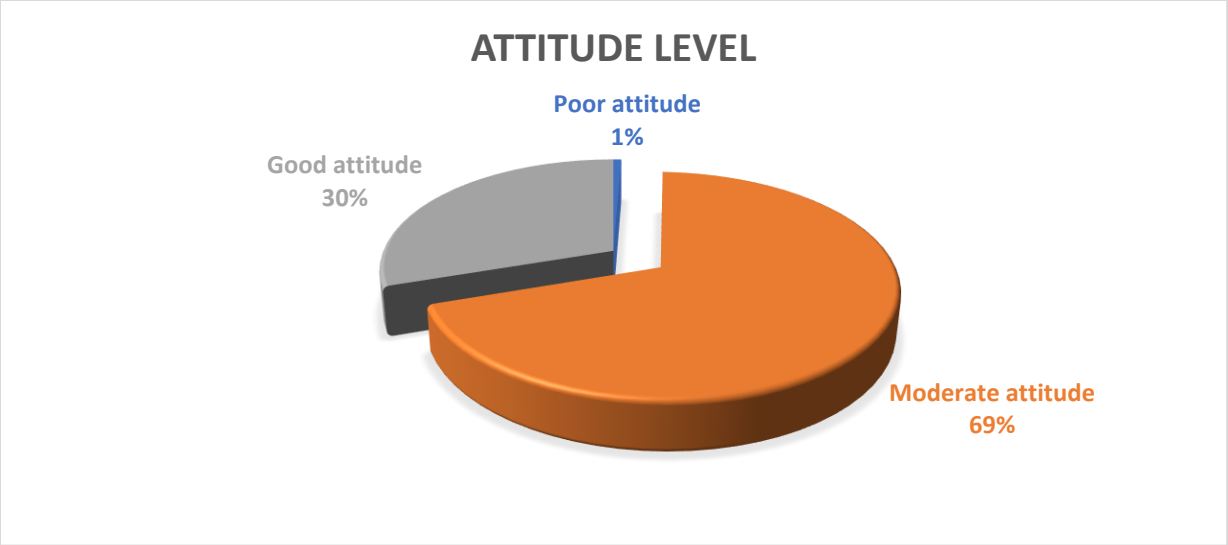


Figure 3: Attitude level of caregivers towards oral health

5.4.2 Practice of Caregivers towards oral health

Median practice level (IQR) 2(1,3). Based on Bloom's cut-point classification, the majority of parents/caregivers 308(97.8%) demonstrated poor oral health practice for their children with congenital heart disease. while 7(2.2%) showed moderate practice.



Figure 4: Practice level of caregivers towards oral health

5.5 Dental Health Status

Overall dental status was determined using a composite measure of dental caries and gingival health. Dental caries was assessed using the dmft/DMFT index, and gingival health was evaluated

using the Gingival Index. Children with either dental caries (dmft/DMFT ≥1) or gingivitis (GI ≥1) were classified as having poor dental status, while those with no caries and healthy gingiva were classified as having good dental status

A total of 315 children with congenital heart disease were assessed for dental and gingival health. Regarding gingival status, 187 (59.4%) had normal gingiva, while 86 (27.3%) had mild gingivitis and 42 (13.3%) had moderate gingivitis, indicating that 40.6% of the participants had some degree of gingival inflammation. Dental caries assessment of permanent teeth among 138 eligible children showed that 95 (68.8%) were caries-free, whereas 43 (31.2%) had dental caries, with 32 (23.2%) classified as low caries and 11 (7.9%) as moderate to extensive caries. Among 260 children with primary (deciduous) teeth, 144 (55.4%) were caries-free, while 116 (44.6%) had dental caries, including 76 (29.2%) with low caries and 40 (15.4%) with moderate to extensive caries. Using a composite measure that combined dental caries and gingival health, only 104 (33.0%) of the children were classified as having good dental status, while the majority, 211 (67.0%), had poor dental status

Table 4: Dental Status of Study Participants at TASH

		Frequency	Percent
GI Category	Mild Gingivitis (0.1–1.0)	86	27.3
	Moderate Gingivitis (1.1–2.	42	13.3
	Normal	187	59.4
	Total	315	100.0
Dental Caries: Permanent teeth	Caries free	95	68.8
	Low Caries	32	23.2
	Moderate Caries	9	6.5
	Extensive Caries	2	1.4
	Total	138	100.0
Dental Caries primary (deciduous) teeth	Caries free	144	55.4
	Low Caries	76	29.2
	Moderate Caries	25	9.6
	Extensive Caries	15	5.8
	Total	260	100.0
Dental Status	Good	104	33.0
	Poor	211	67.0
	Total	315	100.0

Table 5:. Factors associated with poor dental status among children with CHD at TASH

Variable		Good n (%)	Poor n (%)	COR	AOR	p-value
Child age	2–5 years	66(52.8)	93 (48.9)	1	1	
	6–11 years	31 (24.8)	67(35.3)	1.53[0.90-2.60]	**1.87(1.05–3.31)**	**0.033**
	12–19 years	28 (22.4)	30 (15.8)	0.76[0.41-1.39]	0.84 (0.44–1.60)	0.597
Child sex	Male	57 (36.1)	101 (63.9)	1	1	
	Female	47 (29.9)	110 (70.1)	1.32[0.82-2.11]	1.30 (0.75–2.23)	0.347
The median age of caregivers, IQR in years		35 (30, 39)		1.0[1.00-1.07]	1.02 (0.98–1.06)	0.299
Parent/Caregiver education	No formal education	10.8 (8.0)	8 (4.2)	1	1	
	Primary school	41 (32.8)	61 (32.1)	1.86[0.67-5.11]	2.61 (0.86–8.01)	0.091
	Secondary school	42 (33.6)	70 (36.8)	2.08[0.76-5.69]	2.71 (0.87-8.41)	0.084
	College/University	32(25.6)	48 (25.3)	1.87[0.66-5.26]	2.42 (0.75–7.76)	0.138
	Postgraduate	0 (0.0)	3 (1.6)	--	—	0.999
Diagnosis	CHD	111 (88.8)	179 (94.2)	2.05(0.9-4.68)	1.76(0.73-4.25)	0.208
	RHD	14 (11.2)	11 (5.8)	1	1	
Type of CHD	A cyanotic	17 (23.3%)	56 (76.7%)	1	1	
	Cyanotic	75 (34.6%)	142 (65.4%)	0.57[0.31-1.05]	0.73 (0.37–1.45)	0.372
	not sure	1 (50.0%)	1 (50.0%)	0.30[0.01-5.11]	0.54 (0.02–13.28)	0.703
Median IQR Duration of illness		4 (2,5)		0.56[0.34-0.94]	0.75(0.43–1.29)	0.297
Referred by a cardiologist to a dentist	**No**	102 (34.1%)	197 (65.9%)	1	1	
	Yes	2 (12.5%)	14 (87.5%)	3.62[0.80-16.25]	2.12[0.80-16.25]	0.093
Knowledge level	Poor	101 (80.8)	114 (60.0)	**0.35(0.21-0.60)**	**0.33(0.17-0.61)**	**0.000**
	Good	24 (19.2)	76 (40.0)	1	1	

6.Discussion

The magnitude of poor dental health was found to be 60.3% among children with heart disease attending TASH pediatric cardiac clinic,31.4%/44.6% having DMFT/dmft> 1, and 13.3% has moderate gingivitis. A similar study in India showed 56.7 % of extensive caries among children with CHD(29). A study in Thailand stated 89.4 % of children with congenital heart disease have caries w/c showed poor dental health (caries) is highly associated with heart disease(30). Another study done in Africa, Sudan, which has a similar health care system to Ethiopia, showed 66.7 % prevalence of caries among children with CHD(10). Overall, this showed the high burden of poor dental health among children with congenital heart disease worldwide

In our study, we found 57.8% of children had access to a dental clinic near their home, and 54.0% lived within 5 km of a dental facility. Surprisingly, however, 93.3% had never visited a dental clinic. The main reported reason was no referral (36.0 %), followed by poor parental knowledge about the importance of dental care (25.4%), and the high cost of treatment. The vast majority of children with heart disease (94.9%) had never been referred to a dental clinic by their cardiologist. This finding of our study is supported by A study from Sudan w/c showed 80% had never visited for regular preventive checkups or treatment (10). The reason is explained by the absence of dental insurance coverage by the government w/c has a similar finding to the current study(40.6%)

Our study found that 68.3% of caregivers had poor knowledge regarding dental health. However, their attitude toward oral health was moderate, while actual dental care practices were almost non-existent, with 98% reporting little to no practice. A similar study done here in TASH showed poor knowledge, practice, and attitude towards dental health among caregivers of children with heart disease.(11) A study done in London also has similar findings(31).

Our study sought Children aged 6–12 years were more likely to have good dental health compared with children aged 2–5 years, with an odds ratio of 1.87 (95% CI: 1.05–3.31). This age-related pattern is also reflected in other settings. For example, a study from Germany reported that children 7–12 years had significantly different dental health outcomes compared with other age groups ($p = 0.009$)(6), Another study conducted in Brazil similarly supports an age-associated difference in dental health status(32). Overall, these results suggest that dental health varies meaningfully by age, potentially reflecting changes in caregiver awareness, hygiene practices, diet, and access to preventive dental services as children grow older. The possible scientific for good outcome Brush

their teeth independently and more regularly, Understand basic dental hygiene instructions, Rinse after meals, Cooperate better during dental visits

Our study found that children whose caregivers demonstrated poor oral health knowledge had significantly reduced odds of good dental status compared with those whose caregivers had good knowledge (AOR = 0.33; 95% CI: 0.17–0.61). This suggests that inadequate caregiver knowledge is an important determinant of poorer oral health outcomes in this population. The finding aligns with prior evidence from other countries: a study in China showed that parental oral health knowledge was independently associated with children's poor oral health ($p = 0.001$)(32), and a study from Malaysia likewise reported a significant relationship between poor parental knowledge and unfavorable dental health ($p = 0.005$)(33).

6.1. Strengths and Limitations of the Study

This is the first study in Ethiopia to provide clinically confirmed oral health data in children with heart disease, especially congenital heart disease (CHD), as prior local research relied solely on caregiver-reported parental knowledge without clinical examination, leaving disease prevalence unknown. use of WHO Oral health survey criteria(dmft/DMFT) and the gingival index ensures direct comparability with global studies, enabling cross national benchmarking, and all clinical examination were performed by trained dental professionals, eliminating self-report biases for oral disease outcome. The study also achieved an adequate sample size, providing sufficient statistical power to detect meaningful differences and support its primary conclusions, reducing the risk of type 2 error. However, as a single-center study conducted at TASH, the findings may not generalize to children with CHD in other Ethiopian regions, rural settings, or hospitals with different patient demographics, referral patterns, or access to dental services. Furthermore, data on knowledge, attitude, practice, accessibility, affordability, reason for not visiting the dentist, and counselling received were collected from caregivers and are subject to recall bias, as caregivers may inaccurately remember the frequency of toothbrushing, past dental visit, or specific counselling message. Social desirability bias also has influenced responses, with caregivers potentially over-reporting barriers and under-reporting barriers w/c could lead to an overestimation of good oral hygiene practice and an underestimation of true barriers. Consequently, the association between caregiver-reported factors and children's clinical oral health status may be attenuated or distorted, and the true burden of poor oral hygiene and unmet dental need may be higher than reported

6.2. Conclusion and Recommendations

Based on the findings of the current study and the identified gap in care, the following recommendations are proposed to improve oral health outcomes in children with heart disease Parents and caregivers of children with heart disease should receive structured, repeated education regarding the critical importance of maintaining optimal oral hygiene. Educational sessions should be integrated into routine cardiology follow-up visits and include practical guidance on age-appropriate toothbrushing techniques, dietary sugar reduction, and recognition of early signs of gingival inflammation

Routine oral health assessments must be systematically integrated into every follow-up visit at the cardiac clinic of Tikur Anbessa Specialized Hospital (TASH). Specifically, cardiology nurses or clinicians should be trained to perform a brief but standardized oral examination to screen for visible caries and signs of gingivitis. A dedicated dental status section should be incorporated into the standard medical record template. This documentation will serve as a trigger for appropriate action and allow for longitudinal monitoring.

A formal, structured referral pathway from the cardiology department to the dental unit at TASH must be established, addressing the current very low referral rate of 5.1%. This pathway should include a clear, written protocol that defines objective criteria for referral. priority status should be assigned to children with heart disease, ensuring timely dental evaluation and treatment, ideally within two weeks for non-urgent cases and within 48 hours for those with active infection or pending surgery.

A prospective multi center study across several tertiary cardiac centers in Ethiopia is strongly recommended to validate and extend the current findings.such a study would improve generalizeblity across different patient demographic,clinical practice and geographic region.multi center collaboration would also enable larger sample size to assess association between oral health status and clinical outcome such as hospitalization for infective endocarditis or post operative recovery time

Future studies should expand data collection to include several variables not captured in the current work. Specifically, researchers should document the formulation (liquid vs tablet) and sugar content of chronic cardiac medication as prolonged exposure to sucrose based liquid medication is

known cariogenic risk factor. additionally, fluoride exposure should be systematically assessed, including use of fluoridated toothpaste, drinking eater fluoride level and any professional fluoride varnish application. other relevant factors to consider are frequency of snacking, access to regular dental care outside the hospital, history of previous dental extraction, and maternal oral health status. including this variable will allow for more precise risk stratification and targeted intervention.

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8. Annexes

Annex I: Data collection tool

Informed Consent Form (English Version)

Research Title: Dental health status and associated factors among children with heart disease attending the cardiac clinic of Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia.

Principal Investigator: [Dr.Melat Shewabera, Addis Ababa University/ pediatrics and child health department

You are invited to participate in a research study that aims to assess the dental health status of children with heart disease and identify factors that may influence it.If you agree to take part, you will be asked questions about your background and your knowledge and practice regarding your child's oral health, which will take about 20 minutes. In addition, your child will undergo a simple, safe, and painless oral examination using a clean mirror to check for dental caries: this will take about 10 minutes and involve no radiation. There is minimal risk involved in this study, although some question feels personal, and you are free to skip any question you are not comfortable answering. While there may be no direct benefit to you, your child will receive a free dental check-up, and if urgent dental problems are identified, you will be referred to the TASH dental clinic. The information obtained from this study will help improve care for other children with heart disease in the future. Your privacy will be strictly maintained; no name will be recorded, and all data will be coded, securely stored, and accessed only by the research team. Participant is completely voluntary, and you have the right to withdraw at any time without any penalty or loss of benefit. If you have any questions, you may contact Dr.Melat Shewabera at 0910244456 or shewberamelat@gmail.com.by signing below, you confirm that you have read or been informed about the study, had the opportunity to ask questions, and voluntarily agree to participate

Participant's Signature (or Thumbprint): _____

Date: _____

Researcher's Name (Dr. Melat Shewabera): _____

Researcher's Signature: _____

Date: _____

Assent Form for Children (Simplified Language)

HELLO, my name is Dr.Melat Shewabera. I am doing a project to learn about the teeth of children who came to this hospital. If you say it's ok, I will ask your mom or dad some questions and look at your teeth using a small mirror, which will not hurt. It's completely your choice to take part, you don't have to participate if you don't want to, and its ok to say no. Even if you say ok now you can change your mind at any time. If you would like to help me, you can make your decision by signing your name or drawing an X to say either

Yes, I will be in the study…….

No, I don't want to be in the study……

Data Collection Tool - Clinical Examination Form

Clinical Examination Form (Abbreviated Version)

Child ID: _____ Examiner: _____ Date: //____

A. Dentition Status (Circle all that apply for each tooth)
(Note: A tooth is recorded as carious if a lesion presents an unmistakable cavity.)

Tooth	Sound	De-cayed (D/d)	Missing (M/m)	Filled (F/f)	Tooth	Sound	De-cayed (D/d)	Missing (M/m)	Filled (F/f)
55					75				
54					74				
...					...				
11					31				
Total D		**Total M**		**Total F**		**dmft/DMFT Score:**			

B. Gingival Index (GI)
*(Score: 0-3 for each surface: 0=Normal, 1=Mild, 2=Moderate, 3=Severe) *

Tooth	Disto-Facial	Facial	Mesio-Facial	Lingual
16				
21				
24				
36				
41				
44				
Total GI Score:		**Average GI (Total/24):**		

Oral Health Knowledge, Attitudes & Practices Questionnaire

Section A: Socio-Demographic Information

1. Age of parent/caregiver

   _____

2. Gender of parent/caregiver

   - Male
   - Female

3. Relation to the child

   - Mother
   - Father
   - Guardian
   - Other:-_____

4. Parent/caregiver's education level

   - No formal education
   - Primary school
   - Secondary school
   - College/University
   - Postgraduate

5. Occupation

   _____

6. Monthly family income (Birr)

   _____

7. Place of residence

   - Urban
   - Rural

Section B: Medical Factors

1. Child ID

_____

2. Child's age: __ years

_____

3. Child's sex:

- Male
- Female

4. Diagnosis:

- CHD
- RHD
- Both

5. Type of CHD

- Cyanotic
- A cyanotic
- Not sure

6. Duration of illness:

_____ Years

7. Frequency of hospital visits

_____ Years

8. Medication currently used

- Diuretics
- ACE inhibitors
- Beta-blockers
- Supplements
- other:-

9. Do the medications cause dry mouth or mouth problems?

- Yes
- No
- Not sure

10. Has your child ever been given prophylactic antibiotics before a dental procedure?

- Yes
- No
- Not sure

11. Has your child ever had infective endocarditis?

- Yes
- No
- Not sure

12. Has any doctor talked to you about oral health and your child's heart disease?

- Yes
- No

Section C: Dental Care Accessibility and Utilization

1. Is there a dental clinic near your home?

- Yes
- No

2. Distance to nearest dental clinic

_____

3. Is specialized pediatric dental care available to you?

- Yes
- No
- Not sure

4. Are dental services affordable?

- Yes
- No
- Sometimes

5. Does your child have dental insurance coverage?

- Yes, full
- Yes, partial
- No

6. Is it easy to get a dental appointment?

- Yes

- No
- Sometimes

7. Have you ever been referred by a cardiologist to a dentist?

- Yes
- No

8. Is communication between cardiologists and dentists adequate?

- Yes
- No
- Not applicable

9. Has your child visited a dentist in the last 12 months?

- Yes
- No

10. How often does your child visit the dentist?

- Regularly
- Only when in pain
- Occasionally
- Never

11. Reasons for not visiting the dentist

- High cost
- No nearby clinic
- Long waiting time
- Lack of transportation
- Child fear
- Parent fear
- Not considered important
- No referral
- Lack of time
- No specific reason
- Other:-_____

Section D: Knowledge about Oral Health

1. Is the treatment of a toothache as important as the treatment of any body organ?

- Yes
- No

2. Can poor oral hygiene complicate heart disease?

- Yes
- No

3. Are regular dental visits necessary?

- Yes
- No

4. Can tooth decay be prevented by brushing?

- Yes
- No

5. Can tooth decay be prevented by reducing sweets?

- Yes
- No

6. Can fluoride prevent tooth decay?

- Yes
- No

7. Do you know what infective endocarditis is?

- Yes
- No

8. Are antibiotics needed before dental procedures in some heart patients?

- Yes
- No

9. Are children with CHD more vulnerable to dental infections?

- Yes
- No

10. Can untreated dental caries delay heart surgery?

- Yes
- No

Section E: <u>Attitude (Liker Scale)</u>

Scale: 1 = strongly disagree,

Scale: 2 = Disagree,

Scale: 3 = Neutral,

Scale: 4 = Agree,

Scale: 5 = strongly agree

1. Good oral hygiene is essential for my child's heart health.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - strongly agree
2. Regular dental checkups are important for my child.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - strongly agree
3. Children with congenital heart disease require specialized dental care.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - strongly agree
4. I am worried about dental infections affecting my child's heart.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - strongly agree

5. I feel confident that I can help my child maintain good oral hygiene.

- Strongly disagree
- Disagree
- Neutral
- Agree
- strongly agree

6. I am willing to follow dental recommendations provided by healthcare professionals.

- Strongly disagree
- Disagree
- Neutral
- Agree
- strongly agree

7. I am interested in receiving more education about oral health and heart disease.

- Strongly disagree
- Disagree
- Neutral
- Agree
- strongly agree

Section F: Oral Hygiene Practices

1. What does your child use to clean their teeth? (Select all that apply)

- Toothbrush with fluoride toothpaste
- Toothbrush with non-fluoride toothpaste
- Mouth rinse with water only
- Mouth rinse with commercial mouthwash
- Using a finger with water
- Nothing
- other:-_____

2. How often does your child brush their teeth?

- Twice daily
- Once daily
- Occasionally
- Rarely
- Never

3. When does your child brush?

- Morning & before bed

- Morning only
- Night only
- After meals
- No specific schedule
- Never brushes

4. What type of toothpaste does your child use?

- Fluoride toothpaste
- Non-fluoride toothpaste
- Herbal toothpaste
- Does not use toothpaste
- Don’t know

5. What is your role during your child’s tooth brushing?

- I brush for the child
- I supervise and assist
- I supervise sometimes
- I advise but do not watch
- I do not supervise at all

6. How often does your child consume sugary foods (sweets/chocolate/cookies/soft drinks)?

- Rarely (1–2 times per week)
- Daily
- Multiple times a day
- Never

7. How often does your child consume sweetened medications (syrups)?

- Regularly
- Occasionally
- Rarely
- Never

8. Does your child take milk or snacks at night without brushing afterward?

- Yes
- No

9. Has your child visited a dentist in the past 12 months?

- Yes
- No

10. How often does your child visit the dentist?

- Every 6 months
- Once a year
- Only when in pain
- Never

11. If your child does not brush regularly, what is/are the reason(s)?

- Child refuses
- Parent forgets
- Cannot afford toothpaste
- Toothbrush unavailable (barrier)
- Parent does not think brushing is necessary (poor)
- Child does not like toothpaste (minor barrier)
- Lack of knowledge (modifiable)
- Other:-_____