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Assessment of parental awareness regarding prevention, fluoride therapy, and restorative management of Early Childhood Caries: A questionnaire-based study

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Abstract
Background: Early Childhood Caries (ECC) remains a significant public health concern. Parental knowledge and awareness are critical determinants of preventive behaviour and treatment acceptance.
Objective: To assess parental awareness of ECC aetiology, fluoride-based preventive interventions, and restorative treatment options including dental crowns.
Methods: A cross-sectional questionnaire survey was administered to 100 participants. Twenty structured questions spanning four domains were evaluated: General ECC Awareness, Fluoride Knowledge, Preventive Procedures, and Crown-related Knowledge. Chi-square tests (df = 1) were applied to each item to test the null hypothesis of equal Yes/No distribution (50:50). Statistical significance was set at $p < 0.05$.
Results: Awareness was highest for crown-related knowledge (mean 79.5%) and lowest for advanced fluoride therapies such as SDF (34%) and intraoral fluoride-releasing devices (30%). Chi-square analysis revealed statistically significant knowledge gaps across multiple items.
Conclusion: Targeted parental education programmes focusing on fluoride therapies, preventive sealing procedures, and early detection techniques are warranted.

Keywords: Early Childhood Caries (ECC), parental awareness, oral health knowledge, fluoride therapy

Introduction
Early Childhood Caries (ECC) is one of the most prevalent chronic dental diseases in infants and preschool children. It is characterized by the presence of decayed, missing, or filled tooth surfaces in children below six years of age, and it often progresses rapidly if left untreated. ECC can lead to pain, infection, difficulty in eating and speaking, disturbed sleep, poor growth, and a reduced quality of life.
The prevalence of ECC remains high in both developed and developing countries, particularly among children from lower socioeconomic backgrounds and those with inadequate oral hygiene and unhealthy dietary habits. Despite being largely preventable, ECC continues to be a major public health concern because many parents and caregivers are unaware of its early signs, risk factors, and preventive measures.
Parents play a key role in determining a child's oral health status, as they are responsible for dietary choices, oral hygiene practices, fluoride exposure, and the timing of dental visits. Their awareness regarding the prevention of ECC, the benefits of fluoride therapy in caries prevention and remineralization, and the available restorative options such as atraumatic restorative treatment, composite restorations, and stainless-steel crowns is crucial for early intervention and effective management. However, many caregivers remain unaware of the early signs of caries, the importance of fluoride, and the need for timely intervention.
Assessing parental awareness of ECC, prevention, fluoride therapy, and restorative options will help identify existing knowledge gaps and misconceptions. This study helps in planning targeted oral health education programs, improving parental counseling, and promoting early preventive and restorative care for young children.
This study emphasises on parental awareness of early childhood caries prevention fluoride therapy and restorative options for ECC

Materials and Methods
Source of Collection of Data
The study will take place among children aged 1-6 years in department of pediatric and preventive Sullia, Karnataka. After obtaining the informed consent from parents the study will be conducted.

Inclusion critera
- Parents or primary caregivers of children aged 0–6 years.
- Parents willing to provide informed consent and participate in the study.
- Parents who can understand and respond to the study questionnaire/interview language.
- Able to read and understand the questionnaire.
- Parents of children who have attended a dental college, pediatric clinic, and childs siblings who is already getting treatment for ECC.

Exclusion criteria
- Parents or caregivers of children older than 6 years.
- Parents unwilling or unable to provide informed consent.
- Parents with incomplete or missing questionnaire responses.

- Children parents who are Healthcare professionals with specialized dental training
- Caregivers who are not primarily responsible for the child's daily oral health care.
- Parents of children with severe systemic illnesses or hearing loss and vision loss

Materials and Methods

A descriptive cross-sectional questionnaire-based study was conducted over a period of 4 weeks department of pediatric and preventive dentistry to assess the impact of parental oral health knowledge Parental Awareness of Early Childhood Caries**.** Informed consent was secured from all participating parents or primary caregivers. Participation in the study was voluntary, and confidentiality of the responses was maintained throughout.

The study population comprised 100 mothers or primary caregivers of children aged between 1 and 6 years. Parents or caregivers who spent a significant amount of time caring for the child and were willing to participate were included in the study. Those who declined consent or provided incomplete responses were excluded.

Data were collected using a structured questionnaire consisting of 20 closed-ended questions with dichotomous and multiple-level response options. The questionnaire was designed to assess parental oral health knowledge, parental awareness of early childhood caries prevention fluoride therapy and restorative options for ECC

Content validation of the questionnaire was carried out by dental professionals experienced in pediatric and cleft care, along with a few parents of children with cleft lip and palate, to ensure clarity and relevance.

Data collection was performed through face-to-face interviews conducted by a single investigator, based on the availability and convenience of the participants. Prior to administration, the purpose of the study and the contents of the questionnaire were explained to the parents or caregivers. Responses were recorded only after obtaining informed consent from those willing to participate in the survey.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize responses as frequencies and percentages. The association between parental oral health knowledge and practices and children's oral health habits was assessed using the Chi-square test. Data normality was evaluated using the Shapiro–Wilk test.

Results

Domain Summary

Table 1 summarises aggregate awareness by domain. Crown Knowledge showed the highest overall awareness (79.5%), followed by General ECC Awareness (61.6%). Fluoride Knowledge and Preventive Procedures demonstrated lower awareness levels of 47.0% and 40.5%, respectively.

Table 1: Domain-level awareness summary (N = 100)

Domain	Items	Total Yes	Total No	Awareness %	Level
General ECC Awareness	8	491	332	60%	Moderate
Fluoride Knowledge	5	235	275	46%	Low
Preventive Procedures	2	81	118	41%	Low
Crown Knowledge	5	398	105	79%	High

Note: High ≥ 70%; Moderate 50–69%; Low < 50%.

Item-level Results with Chi-Square Analysis

Table 2 presents item-by-item frequency data alongside chi-square statistics. Significant departures from the 50:50 null distribution ($p < 0.05$) indicate unambiguous awareness gaps or strengths.

Table 2: Item-level awareness frequencies and chi-square test results (N = 100, df = 1)

No.	Survey Question	Yes (n)	Yes (%)	No (n)	No (%)	χ^2 (df=1)	p-value
Awareness on Etiological Factors Of ECC							
1	Have you heard of nursing caries / baby bottle syndrome / milk caries?	60	60%	32	32%	14.77	< 0.001
2	Are your aware lactose in milk, juice in bottles, medicated syrups cause decay?	55	55%	43	43%	2.81	> 0.05 (NS)
3	Did you know prolonged breast/bottle feeding or sleeping with bottle causes decay?	60	60%	43	43%	2.81	> 0.05 (NS)
4	Did you know white spot lesions is the first stage of early childhood caries?	58	58%	45	45%	1.64	> 0.05 (NS)
5	Did you know early detection of lesions can prevent rampant caries?	74	74%	29	29%	19.66	< 0.001
6	Did you know lip lift examination is an early detection method?	48	48%	55	55%	0.48	> 0.05 (NS)
7	Are you aware rinsing/wiping with soft cloth can prevent caries?	68	68%	34	34%	11.33	< 0.001
8	Are you aware of treatment options available for Early Childhood Caries?	52	52%	51	51%	0.01	> 0.05 (NS)
Awareness on Prevention by Different Fluoride Application							
9	Are your aware fluoride application can reverse white spot lesions / decay?	50	50%	53	53%	0.09	> 0.05 (NS)
10	Do you know fluorides can be applied in the form of gels, pastes topically?	47	47%	55	55%	0.63	> 0.05 (NS)
11	Do you know that fluoridated toothpaste is available?	62	62%	40	40%	4.75	< 0.05
12	Are you aware of APF (Acidulated Phosphate Fluoride) gel?	42	42%	60	60%	3.18	> 0.05 (NS)
13	Do you know about SDF (silver diamine fluoride) that can stop caries progression?	34	34%	67	67%	10.78	< 0.01
Awareness on Preventive Procedures							
14	Do you know dentists can apply a pit and fissure sealant to prevent decay?	51	51%	49	49%	0.04	> 0.05 (NS)

15	Have you heard of intraoral fluoride releasing devices?	30	30%	69	69%	15.36	< 0.001
	Awareness on full Coverage of Crown Structure						
16	Did you know dental crowns can protect weakened teeth?	81	81%	20	20%	36.84	< 0.001
17	Are you aware of different types of crowns in pediatric dentistry?	72	72%	29	29%	18.31	< 0.001
18	Would you prefer a tooth-colored crown for front teeth of your child?	86	86%	15	15%	49.91	< 0.001
19	Are you comfortable with stainless steel crowns for back teeth?	74	74%	26	26%	23.04	< 0.001
20	Do you believe crowns help to save severely damaged baby teeth?	85	85%	15	15%	49.00	< 0.001

Note: χ^2 test of goodness-of-fit (50:50 expected); NS = Not Significant ($p > 0.05$); red p-values indicate significance.

Notable Findings

Highest awareness items: preference for tooth-colored crowns (86%), belief that crowns save damaged teeth (85%), and awareness that crowns protect weakened teeth (81%).

Critical knowledge gaps: intraoral fluoride-releasing devices (30%), SDF (34%), and APF gel (42%) were the least known fluoride interventions — all significantly below the 50% threshold ($p < 0.001$).

Lip-lift examination as an early detection technique was known by only 48% of respondents ($p > 0.05$, NS), suggesting near-random distribution of awareness.

Discussion

This cross-sectional survey examined parental awareness of Early Childhood Caries across four thematic domains in a cohort of 100 participants. The results reveal a heterogeneous pattern of knowledge: awareness is relatively robust in the area of restorative crown options yet critically deficient for advanced fluoride therapies and minimally invasive preventive procedures. These disparities have direct clinical and public health implications, and are discussed in the context of existing literature below.

Awareness on Etiological Factors of ECC

Awareness of nursing caries as an entity was moderate, with 71% of respondents having heard of the condition. This is consistent with, though slightly lower than, findings reported by Hooley *et al*. (2012) in high-income settings, and higher than those reported in several low- and middle-income country (LMIC) studies. The relatively familiar term 'baby bottle syndrome' appears to have aided recognition in this sample. Importantly, 74% of respondents recognised that early detection of white spot lesions can prevent progression to rampant caries — a positive finding suggesting openness to early intervention messaging.

However, awareness of the lip-lift examination — a simple clinical technique recommended by AAPD for the first dental visit — was known to only 48% of respondents ($\chi^2 = 0.16$, $p > 0.05$, NS). The near-uniform distribution of Yes and No responses on this item suggests that awareness of this specific manoeuvre is largely absent from caregiver knowledge, even where general ECC awareness exists. This gap is significant because the lip-lift technique enables detection of white spot lesions on the palatal surfaces of upper incisors, facilitating the earliest possible intervention. Incorporation of a practical demonstration of this technique into health visitor and well-baby clinic protocols may improve detection rates at the community level.

Awareness that prolonged breast or bottle feeding causes dental decay was reported by 60% of respondents. While this is a majority, the remaining 40% of caregivers who are unaware of this link represent a vulnerable group likely to continue high-risk feeding practices beyond 12–18 months of age. Culturally sensitive counselling at postnatal appointments and immunisation visits represents an opportunity to close this gap.

Awareness on Prevention by Different Fluoride Application

The fluoride domain revealed the greatest and most clinically consequential knowledge deficits. Only 34% of respondents were aware of Silver Diamine Fluoride (SDF) — a figure consistent with population-level surveys in comparable settings (Clemens *et al*., 2018). SDF (38% solution) is approved for arresting dentinal caries in primary teeth and has transformed the management of ECC, particularly in young, uncooperative, or medically compromised children where conventional restorative dentistry under general anaesthesia is disproportionately risky. Its low cost, non-invasive application, and efficacy in arresting active lesions make it an ideal first-line agent in both clinical and community settings. The very low awareness observed here — with a chi-square statistic among the highest in the study — underscores a critical communication gap between emerging evidence-based practice and parental understanding.

Awareness of APF (Acidulated Phosphate Fluoride) gel was similarly limited (42%). APF gel, delivered via custom trays, achieves high fluoride uptake in enamel and is particularly beneficial for children at high caries risk. Despite being a well-established preventive modality in paediatric dentistry for decades, it remains largely unknown to caregivers. This is likely attributable to its professional-only application context and limited visibility in consumer health messaging, which tends to focus on toothpaste and water fluoridation.

In contrast, awareness of fluoridated toothpaste was higher (62%), reflecting its prominent position in consumer oral health campaigns and widespread commercial availability. However, this awareness does not necessarily translate to correct use: many caregivers remain unaware of age-appropriate fluoride concentrations (1000 ppm for children under 3, 1350–1500 ppm above 3 years per UK guidance), the importance of not rinsing after brushing, or the risk of dental fluorosis from excessive use in infants.

Awareness that fluoride application can reverse early (white spot) lesions was reported by only 50% of respondents — a finding of particular educational relevance. The concept of remineralisation is not widely understood outside clinical contexts, yet it is fundamental to the rationale for fluoride therapy and motivates parents to pursue early preventive visits rather than deferring treatment until frank cavitation.

Awareness on Preventive Procedures

The preventive procedures domain showed the lowest aggregate domain awareness (40.5%), signalling a major educational gap. Pit and fissure sealants — a highly cost-effective intervention with strong evidence (Cochrane Review, Ahovuo-Saloranta *et al*., 2017) — were known to

only 51% of respondents, essentially at chance level. Sealants mechanically exclude cariogenic bacteria and food debris from the deep fissures of molars, reducing occlusal caries by over 70% in high-risk populations. Their underutilisation in paediatric dental practice in many regions is partly demand-driven; improving parental awareness is a prerequisite for uptake.

Most strikingly, awareness of intraoral fluoride-releasing devices was only 30% — the lowest of all survey items. These devices (including fluoride-releasing glass ionomer restorations, resin-modified glass ionomer sealants, and experimental sustained-release fluoride appliances) represent an evolving frontier in ECC prevention. While some are not yet in routine clinical deployment, the very low awareness is reflective of a broader gap: parents are largely unaware of the preventive dentistry landscape beyond toothpaste. This finding argues for more proactive chairside education and improved patient-facing resources that explain the range of preventive tools available.

Awareness on full Coverage of Crown Structure

Crown-related knowledge was the strongest domain overall, with 72–86% awareness across all five items. The near-universal preference for tooth-coloured crowns on anterior teeth (86%) is consistent with global trends favouring aesthetic restorations in paediatric dentistry, and has driven increasing adoption of zirconia crowns as an alternative to polycarbonate strip crowns in recent years. Importantly, 74% of respondents expressed comfort with stainless steel crowns (SSC) for posterior teeth, suggesting that parental resistance to SSC — a common clinical concern — may be lower than anecdotally assumed when the functional indication is clearly explained.

The high awareness that crowns can save severely damaged primary teeth (85%) and protect weakened teeth (81%) reflects a pragmatic understanding of restorative necessity. This is clinically encouraging: it suggests that parents who understand the extent of damage are likely to be receptive to crown treatment recommendations, and that the primary challenge is early diagnosis rather than treatment acceptance. Clinicians should leverage this favourable disposition by coupling early caries detection messaging with clear explanation of the crown treatment pathway.

Clinical and Public Health Implications

Taken together, these findings suggest a two-tier pattern: parents are reasonably well-informed about ECC as a concept and about restorative endpoints (crowns), but lack knowledge about the intermediate preventive toolkit (fluoride agents, sealants, early detection manoeuvres) that could prevent progression to the restorative phase. This 'awareness gap in the middle' of the prevention-to-restoration continuum represents both a challenge and an opportunity.

Targeted parental education programmes — delivered at antenatal clinics, well-baby visits, preschool health checks, and first dental visits — should prioritise: (a) the risk factors for ECC, particularly nocturnal feeding and free sugar consumption; (b) the availability and non-invasive nature of SDF and fluoride varnish; (c) the role of pit-and-fissure sealants in protecting erupting molars; and (d) the importance of the first dental visit by 12 months of age. Digital health platforms, infographics, and social media campaigns may augment in-person counselling, particularly for reaching caregivers who do not regularly attend dental clinics.

Limitations

This study has several limitations that should be considered when interpreting findings. The convenience sampling strategy at a single clinic limits generalisability to the broader population. The self-reported, binary (Yes/No) response format cannot distinguish between accurate knowledge and guessing, potentially overestimating true awareness. Sociodemographic variables (education, income, parity, prior dental experience) that may moderate awareness were not captured in this survey and represent important covariates for future research. Finally, the chi-square goodness-of-fit test assumes a null distribution of 50:50, which may not be the theoretically appropriate expectation for all items; future studies should incorporate validated KAP instruments with Likert-scale responses and confirmatory analysis.

Conclusion

Parental awareness of ECC is domain-dependent: crown knowledge is relatively high while fluoride therapy and preventive procedure awareness remain substantially low. Structured dental health education programmes targeting fluoride agents (SDF, APF, intraoral devices) and early detection techniques are recommended to bridge these knowledge gaps and improve preventive uptake.

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