

# CONTENT ANALYSIS OF PARENTAL INFORMATION ON EARLY CHILDHOOD CARIES IN ONLINE PARENTING WEBSITES

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## ABSTRACT:

**Background:** Parents increasingly rely on online resources for information regarding Early Childhood Caries (ECC). However, the quality, completeness, and reliability of web-based educational materials remain uncertain. This study aimed to evaluate the content and quality of parental information on ECC available on online websites.

**Methods:** A cross-sectional content analysis was conducted on 43 English-language websites identified through Google searches using the keywords "early childhood caries," "baby tooth decay," and "dental decay for children." Websites were evaluated using a standardized checklist assessing the availability of essential ECC information, including definition, causes, risk factors, signs and symptoms, prevention, treatment, oral hygiene, dietary advice, fluoride recommendations, and quality indicators such as authorship, references, visual aids, and content updates. Composite quality scores were compared across website categories using the Kruskal–Walli's test, while the association between website type and availability of an ECC definition was assessed using the Chi-square test. Inter-rater reliability was determined using Cohen's kappa statistic.

**Results:** Among the 43 websites analyzed, dental clinic websites constituted the largest category (30.2%), and most websites were rated as having good overall quality (72.1%). Information on causes, prevention, oral hygiene, and dietary advice was available on all websites, whereas only 51.2% provided a definition of ECC and 72.1% discussed treatment options. Scientific references (32.6%) and recent content updates (41.9%) were infrequently reported. Government websites achieved the highest composite quality scores, while parenting websites had the lowest ( $p = 0.030$ ). Website type was significantly associated with the availability of an ECC definition ( $p = 0.025$ ). Inter-rater reliability demonstrated almost perfect agreement ( $\kappa = 0.87$ – $0.97$ ).

**Conclusion:** Although online resources provide extensive preventive information on ECC, important deficiencies remain in content completeness, transparency, and scientific credibility. Standardized, evidence-based, and regularly updated online educational materials are needed to improve parental oral health literacy and support informed decision-making for the prevention and early management of ECC.

**Keywords:** Early Childhood Caries; Content Analysis; Parenting Websites; Online Health Information; Oral Health Education; Health Literacy.

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## INTRODUCTION

Early Childhood Caries (ECC) is considered as common chronic diseases in children aged under six

years and continues to pose serious public health challenges around the world [1]. ECC has serious consequences for the general health, wellbeing and

oral health of millions of preschoolers across the globe, especially those from economically disadvantaged backgrounds. In spite of ECC being preventable, it places an enormous emotional and economic burden on affected children, their parents, and healthcare providers over the last few decades. ECC manifests itself in terms of pain, infection, problems with chewing, disturbed sleep patterns, malnutrition, decreased quality of life, and higher healthcare service use [2]. Since ECC occurs at an early age, its prevention is largely dependent upon the knowledge of parents and proper hygiene, diet, and regular dental examinations.

Dependence on technology and Artificial Intelligence (Chatbot, ChatGPT, Gemini AI etc.,) is one factor that has radically changed how individuals search for health information over the last two decades [3]. The parents and caregivers usually search online for information about infant feeding practices, teeth eruption, methods of keeping the child's mouth clean, use of fluoride, dietary counselling, and treatment of various dental diseases before planning a consultation with the dentist. Information related to oral care provided by websites created by government departments, hospitals, professional organizations, dental care centres, parenting websites, private organizations, and even social media websites has become an essential source of information due to their availability, cost-effectiveness, and convenience [4].

However, besides providing people with a great amount of information related to health issues, the internet has created many problems concerning the quality and reliability of information. In contrast to scientific literature which is peer-reviewed, patient education online materials are not regulated and greatly differ by such criteria as quality of the information provided, accuracy, completeness, and transparency. Some websites give comprehensive scientifically verified information [5]; while other sources can give out-of-date, incomplete, commercially oriented, or even misleading information. Since parents highly depend on healthcare-related decisions concerning their children, quality evaluation of online patient education materials has become a necessity. Systematic content analysis helps determine whether the information provided to the general audience is scientifically correct, understandable, comprehensive, and appropriate for making an informed decision [6].

The speedy spread of false information via websites and social media has become a growing issue of public health [7]. Misinformation regarding oral health in paediatrics includes beliefs that milk teeth are not crucial because they are temporary, fluoride is dangerous, or natural means are adequate for treating dental decay persists. The spread of such

misinformation could lead to changes in parental perception, lack of trust to evidence-based preventive measures, and postponing seeking professional help. As the development of ECC occurs quickly in early childhood, late detection of cavities or delaying preventive care might lead to carious breakdown which requires complex restoration, pulpotomy, tooth extraction, or treatment under general anaesthesia. Thus, inaccurate information available on the Internet can affect oral health outcomes in children directly due to parental perception and behaviour [8].

Even though there has been an increase in awareness in relation to oral health of children owing to the increased access to information and public health campaigns, having more information does not always translate into health literacy [9]. The availability of immediate answers and some obstacles like limited access to dental care, lack of time, economic factors, fear of the dentist, and experience in the health care system might prompt parents to use the Internet first rather than seek professional opinion [10].

Incomplete or inaccurate educational resources may cause a delay in early detection, deter preventive measures, lead to inefficient self-management tactics, and contribute to the development of the condition [11]. In the case of advanced ECC, the level of invasiveness, cost, and psychological stress involved in the management of the disease is higher compared to that of the initial stages of the condition [12].

Studies examining the quality of health information provided through online sources have been found to exhibit significant variability in relation to quality of content, readability, credibility and compliance with professional standards [13]. While numerous studies have examined the quality of digital health information associated with general medicine and some specific dental diseases, there is a lack of studies examining the quality of digital patient education materials pertaining to Early Childhood Caries [14]. Most of the previous studies have been conducted using either a readability criterion or quality criterion alone, with relatively few studies examining the completeness, scientific accuracy, openness, authorship, citations and reliability of information in different types of websites [15].

Consequently, the current research has been conducted with the aim of assessing systematically the content and the quality of the existing web-based patient educational material on Early Childhood Caries. Through the assessment of web pages which are frequently visited by parents and caregivers using standardized content analysis criteria, this research hopes to assess the accuracy, completeness,

reliability, and quality of information provided in the web pages under various categories.

## 2. Methods

### 2.1. Study Design and Setting

To evaluate the quality, depth, and accuracy of online resources available to caregivers, we utilized a cross-sectional analytical study design focused on web-based content analysis. Data extraction and evaluation were carried out over a three-month period spanning from April 2026 to June 2026.

Since this investigation relied entirely on publicly accessible, identifiable online web content, institutional review board approval provided waiver for our study and participant consent were not required.

### 2.2. Sample Selection and Eligibility Criteria

Unlike traditional clinical or epidemiological investigations, this study used individual websites as the primary units of analysis rather than human subjects. We employed a purposive sampling strategy designed to mirror the actual search behaviour of a parent or caregiver seeking paediatric dental advice online.

To identify the most visible digital resources, we executed targeted queries on the Google search engine using three highly relevant keyword phrases:

- "Early childhood caries"
- "Baby tooth decay"
- "Dental decay for children"

Websites retrieved from these searches were systematically screened against strict eligibility criteria to establish our final analytical sample.

### 2.3. Inclusion Criteria

To be included in the analysis, a website had to meet the following parameters:

- Be published entirely in the English language.
- Directly target parents, guardians, or primary caregivers of children in the early childhood bracket (ages 0 to 6 years).
- Provide actionable, significant information regarding paediatric oral hygiene, dietary practices, early childhood caries (ECC), or general toddler dental care.

### 2.4. Exclusion Criteria

We excluded platforms that did not represent general consumer-facing information. These comprised:

- Peer-reviewed scientific journals, academic databases, and research-exclusive platforms.
- Paid, subscription-only, or membership-restricted websites where content was hidden behind a paywall.
- Websites published in languages other than English.

### 2.5. Sample Size and Extraction Protocol

The target sample size was established at a minimum of 20 distinct parenting and health websites from the top-ranking search results. Once a website was considered eligible, we performed an exhaustive internal audit of the platform to capture its full scope of relevant media. Every unique webpage, article, or resource dedicated to ECC within these 20 websites was included for comprehensive data extraction. After data extraction, the final sample size of the study was extended upto 43 samples.

### 2.6. Variables and Measurement

To systematically evaluate online information regarding Early Childhood Caries (ECC), we defined clear parameters for our content analysis. Because this study evaluates static web media rather than clinical patients, traditional epidemiological factors like biological confounders and effect modifiers were not applicable.

- **Outcome Variables:** The primary focus was on the quality and integrity of the web content. This was quantified through five core metrics: exact accuracy, information completeness, text readability, the presence of misinformation, and overall structural quality.

### 2.7. Data Sources and Assessment Methods

Data were harvested directly from the text and assets of the top parenting and health websites identified via our Google search strategy. To evaluate these sources objectively, we utilized a structured content analysis checklist.

Information completeness and accuracy were cross-referenced with our clinical tests, while textual readability was calculated objectively using the Flesch–Kincaid readability formula. To ensure strict comparability across different website categories, two independent reviewers (the Principal Investigator and a Co-investigator) evaluated every selected webpage using identical, standardized checklist protocols.

## 2.8. Addressing Potential Bias

Observational content analysis is inherently vulnerable to subjective interpretation. To minimize this assessment bias, the two reviewers remained blinded to each other's initial scores during the evaluation phase. Following independent data extraction, we calculated a Cohen's kappa ( $\kappa$ ) coefficient to determine inter-rater reliability. Any scoring discrepancies between the two reviewers were resolved through open discussion until a consensus was reached.

## 2.9. Statistical Analysis

The data were processed and analyzed using SPSS Version 25.0. Quantitative variables, specifically the Flesch–Kincaid readability scores and compiled website quality scores, were handled as continuous data. Descriptive Statistics were tabulated as Frequencies, percentages, and mean readability scores to summarize the overall characteristics of the sampled web content. A p-value of  $<0.05$  is set as statistical significance.

## RESULT

Table 1 shows the characteristics of the websites considered in the current research. In total, there were 43 websites analyzed, among which the highest number belonged to dental clinic websites (30.2%), government/public health websites (18.6%), hospital/medical institution websites (14.0%) and parenting websites (11.6%). As for the quality of the websites, most of the websites were considered good (72.1%), while only 7.0% of the websites were considered excellent; 18.6% of the websites were considered fair, and 2.3% of the websites were considered poor.

The availability of information regarding ECC in the selected sites is displayed in Table 2. The presence of information regarding the cause of ECC, prevention strategies, oral hygiene tips, and dietary tips was present in all sites (100%). The risk factors were identified in 97.7% of the sites, while the information on fluoride was presented in 90.7% of the sites. Sign and symptoms of ECC were addressed in 81.4% of the sites, while the information on treatment was covered in 72.1% of the sites. Only 51.2% of the sites provided an explicit definition of Early Childhood Caries.

Table 3 provides an overview of the quality indicators that were measured in the included web sites. Images, videos, or infographics were found on 55.8% of the web sites, while the authorship of 65.1% of web sites was attributed to qualified health care professionals or professional organizations. At the same time, 34.9% of web sites did not have any recognizable authorship by professional individuals. Scientific sources were cited or referenced in 32.6%

of web sites, and only 41.9% of web sites had been recently updated.

Table 4 shows the availability of the definition of Early Childhood Caries (ECC) by website type. Out of 8 government websites, 6 (75.0%) provided a definition of ECC. Also, out of 6 hospital websites, 4 (66.7%) provided a definition of ECC. Out of 13 dental clinic websites, 12 (92.3%) provided a definition of ECC. Conversely, out of 5 parenting websites, only 1 (20.0%) provided a definition of ECC. Also, 1 of the 4 (25.0%) professional organization websites provided a definition of ECC. All (2 out of 2 or 100%) commercial websites provided a definition of ECC. Statistically, the association between website type and provision of an ECC definition is significant ( $\chi^2 = 12.84$ ;  $df = 5$ ;  $p = 0.025$ ). This means that the probability of providing an ECC definition differed significantly depending on the type of website.

Table 5 illustrates the comparison of the composite content quality scores among the various categories of websites. Government websites have the highest composite mean content quality score ( $10.4 \pm 0.8$ ), followed by hospital websites ( $9.8 \pm 1.0$ ), dental clinics ( $9.6 \pm 1.3$ ), professional organizations ( $9.3 \pm 1.2$ ), and commercial websites ( $9.0 \pm 1.4$ ). Parenting websites have the lowest composite mean content quality score ( $7.6 \pm 1.8$ ). There exists a statistically significant difference among the composite quality scores of different website categories (Kruskal–Wallis  $H = 10.72$ ;  $p = 0.030$ ), suggesting that the quality and completeness of ECC information varied significantly across website categories.

Table 6 shows the inter-rater reliability between two independent reviewers by applying Cohen's Kappa statistic. Perfect agreement was found in all reviewed domains where  $\kappa$  varies from 0.87 to 0.97. The most consistent reviewers were with respect to evaluation of preventive measures ( $\kappa = 0.97$ ), and the least consistency was observed with respect to quality rating ( $\kappa = 0.87$ ).

| Table 1. Characteristics of Included Websites (N = 43) |   |      |
|--------------------------------------------------------|---|------|
| Characteristic                                         | n | %    |
| Website type                                           |   |      |
| Government/Public Health                               | 8 | 18.6 |
| Hospital/Medical Institution                           | 6 | 14.0 |

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|                                   |        |             |
|-----------------------------------|--------|-------------|
| Dental Clinic                     | 1<br>3 | 3<br>0<br>2 |
| Parenting websites                | 5      | 1<br>1<br>6 |
| Professional organizations        | 4      | 9<br>3      |
| Commercial oral health websites   | 2      | 4<br>7      |
| Other health information websites | 5      | 1<br>1<br>6 |
| Overall quality                   |        |             |
| Excellent                         | 3      | 7           |
| Good                              | 3<br>1 | 7<br>2<br>1 |
| Fair                              | 8      | 1<br>8<br>6 |
| Poor                              | 1      | 2<br>3      |

| Table 2. Availability of ECC Information |        |          |
|------------------------------------------|--------|----------|
| Information Domain                       | n      | %        |
| Definition of ECC                        | 2<br>2 | 51<br>.2 |
| Causes discussed                         | 4<br>3 | 10<br>0  |
| Risk factors included                    | 4<br>2 | 97<br>.7 |
| Signs and symptoms                       | 3<br>5 | 81<br>.4 |
| Prevention                               | 4<br>3 | 10<br>0  |

|                         |        |          |
|-------------------------|--------|----------|
| Treatment options       | 3<br>1 | 72<br>.1 |
| Oral hygiene advice     | 4<br>3 | 10<br>0  |
| Dietary advice          | 4<br>3 | 10<br>0  |
| Fluoride recommendation | 3<br>9 | 90<br>.7 |

| Table 3. Website Quality Indicators      |  |             |
|------------------------------------------|--|-------------|
| Quality Indicator                        |  | %           |
| Visual aids (images/videos/infographics) |  | 5<br>5<br>8 |
| References/citations provided            |  | 3<br>2<br>6 |
| Qualified author identified              |  | 6<br>5<br>1 |
| Recent update available                  |  | 4<br>1<br>9 |
| Anonymous authorship                     |  | 3<br>4<br>9 |

| Table 4. Comparison Between Website Type and ECC Definition |                |  |  |  |
|-------------------------------------------------------------|----------------|--|--|--|
|                                                             | Defin<br>ition |  |  |  |
| Website Type                                                |                |  |  |  |

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|                                          |  |                 |  |  |  |
|------------------------------------------|--|-----------------|--|--|--|
| Government                               |  |                 |  |  |  |
| Hospital                                 |  |                 |  |  |  |
| Dental Clinic                            |  |                 |  |  |  |
| Parenting                                |  |                 |  |  |  |
| Commercial                               |  |                 |  |  |  |
| Professional organizations               |  |                 |  |  |  |
| Chi-square test (p value <0.05)          |  |                 |  |  |  |
| Table 5. Composite Content Quality Score |  |                 |  |  |  |
| Website Type                             |  | Mean<br>±<br>SD |  |  |  |
| Government                               |  | 10.4 ± 0.8      |  |  |  |
| Hospital                                 |  | 9.8 ± 1.0       |  |  |  |
| Dental Clinic                            |  | 9.6 ± 1.1       |  |  |  |

|                                     |  |           |  |  |
|-------------------------------------|--|-----------|--|--|
|                                     |  | .3        |  |  |
| Professional organizations          |  | 9.3 ± 1.2 |  |  |
| Commercial                          |  | 9.0 ± 1.4 |  |  |
| Parenting                           |  | 7.6 ± 1.8 |  |  |
| Kruskal–Wallis test (p value <0.05) |  |           |  |  |

|                                  |           |                |
|----------------------------------|-----------|----------------|
| Table 6. Inter-rater Reliability |           |                |
| Variable                         | Cohen's κ | Interpretation |
| Definition                       | 0.93      | Almost perfect |
| Risk factors                     | 0.95      | Almost perfect |
| Prevention                       | 0.97      | Almost perfect |
| Treatment                        | 0.99      | Almost         |

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|                 |      |                |
|-----------------|------|----------------|
|                 |      | perfect        |
| Overall quality | 0.87 | Almost perfect |

## DISCUSSION

The present study evaluated the content quality, completeness, and reliability of online information related to Early Childhood Caries (ECC) available on websites commonly accessed by parents. The findings demonstrate considerable variation in the quality and comprehensiveness of ECC information across different categories of websites [16]. While preventive information, oral hygiene advice, dietary recommendations, and the causes of ECC were consistently presented across all websites, important educational elements such as a clear definition of ECC, treatment options, scientific references, authorship transparency, and recent content updates were frequently absent. These findings suggest that although online resources provide extensive preventive guidance, many fail to deliver comprehensive, evidence-based information that would enable parents to fully understand the disease and make informed oral health decisions [17].

Among the included websites, dental clinic websites constituted the largest proportion, followed by government/public health and hospital websites. Most websites were rated as having good overall quality, indicating that parents are generally exposed to reasonably acceptable online educational materials [18]. Similar observations have been reported by Aguirre et al., who found that online educational resources frequently provide useful preventive advice but often lack comprehensive coverage of Early Childhood Caries. Likewise, systematic reviews evaluating online oral health information have reported substantial variability in the quality, completeness, and credibility of digital health resources, emphasizing the continued need for standardized patient education materials. However, despite the predominance of websites rated as good in the present study, relatively few implemented all recommended quality criteria, indicating that overall quality ratings do not necessarily reflect the completeness or scientific reliability of the information provided.

The present study demonstrated that information regarding the causes of ECC, preventive strategies, oral hygiene recommendations, and dietary advice was available on all websites, while risk factors and fluoride recommendations were also frequently included. These findings indicate that preventive aspects of ECC receive considerable attention in

online educational resources [19]. Similar findings have been reported in previous content analyses of paediatric oral health websites, where prevention-oriented information predominated over diagnostic and treatment-related content. This emphasis on prevention is encouraging because parental knowledge regarding appropriate feeding practices, fluoride use, and oral hygiene plays an important role in reducing ECC risk. Nevertheless, only about half of the websites clearly defined Early Childhood Caries, and fewer than three-quarters discussed available treatment options. The omission of these essential topics may limit parents' understanding of disease recognition, progression, and the importance of timely professional intervention.

The quality indicators assessed in this study further revealed important limitations in the credibility of online information [20]. Although approximately two-thirds of websites identified qualified healthcare professionals or organizations as authors, only one-third provided supporting scientific references, and fewer than half displayed evidence of recent updates. Similar deficiencies have been documented in previous investigations evaluating online health information, where inadequate citation of evidence, lack of transparent authorship, and outdated content were identified as major concerns affecting the reliability of patient education materials. In an era of rapidly evolving evidence-based dentistry, regularly updated information supported by scientific references is essential to ensure that parents receive accurate and trustworthy guidance.

Visual communication represents another important component of effective online health education. Only slightly more than half of the evaluated websites incorporated images, videos, or infographics. Previous studies have demonstrated that visual educational materials improve parental understanding, engagement, and recall of preventive oral health messages, particularly among individuals with limited health literacy. Therefore, increasing the use of high - quality visual aids may enhance the effectiveness of online ECC education while improving user engagement and comprehension.

One of the important findings of the present study was the significant variation in the provision of an ECC definition according to website category. Dental clinic websites demonstrated the highest proportion of websites providing a clear definition of ECC, whereas parenting websites showed the lowest proportion [21]. Government and hospital websites also performed comparatively well, while professional organization websites demonstrated unexpectedly limited coverage. The statistically significant association observed between website category and ECC definition availability suggests that the source of online information substantially

influences the completeness of educational content. Similar observations have been reported in studies evaluating online medical information, where institutional and government websites generally provide more standardized and evidence-based educational content than commercially oriented or general parenting websites. The comparatively poor performance of parenting websites is particularly noteworthy because these platforms are frequently consulted by parents seeking child health information and therefore have considerable influence on parental knowledge and behaviour.

The comparison of composite content quality scores further supports these findings. Government websites achieved the highest overall content quality scores, followed by hospital and dental clinic websites, whereas parenting websites demonstrated the lowest scores. The statistically significant difference observed among website categories indicates that the quality and completeness of ECC information vary considerably depending on the source. These findings are consistent with previous studies reporting that government and academic health websites generally adhere more closely to evidence-based recommendations due to institutional review processes and professional oversight [22]. Conversely, parenting websites often prioritize readability and accessibility over scientific completeness, potentially resulting in simplified or incomplete health information. While such websites may be useful for increasing awareness, they should not replace information obtained from evidence-based professional sources.

An important methodological strength of the present study was the excellent inter-rater reliability observed across all evaluated domains [23]. Cohen's kappa values ranging from 0.87 to 0.97 indicate almost perfect agreement between independent reviewers, confirming the consistency and reproducibility of the content evaluation process. Similar levels of agreement have been considered indicative of robust methodological quality in previous content analysis studies evaluating online health information. The high reliability strengthens the validity of the findings and minimizes the possibility of subjective assessment bias.

Overall, the findings of the present study highlight the continuing need to improve the quality, transparency, and comprehensiveness of online educational resources related to Early Childhood Caries. Since parents increasingly rely on the internet for child health information before consulting dental professionals, ensuring that online resources provide accurate, evidence-based, and regularly updated information is essential. Government agencies, professional dental organizations, universities, and dental practitioners should collaborate to develop standardized online

educational materials that include comprehensive information on disease definition, risk factors, prevention, treatment, fluoride recommendations, and appropriate professional references. Improving the quality of online ECC information has the potential to enhance parental oral health literacy, facilitate early recognition of disease, promote timely dental attendance, and ultimately contribute to reducing the burden of Early Childhood Caries.

## CONCLUSION

This study identified the disparity in the quality of information about early childhood caries (ECC) provided on the websites. The websites lacked the essential information such as diagnosis, treatment, and scientific references, and credibility of the authors, and updates on the disease. Preventive measures, oral hygiene advice, and diet were reported; however, most sites provided limited information on ECC. Government and medical organizations' sites contained more information than the parenting websites. Parents increasingly rely on the Internet for information regarding their child's health, making it critical to improve the quality and credibility of information for effective oral health promotion and disease prevention.

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