

Early Establishment of Dental Care and Time to First Operative Treatment in Children: A Retrospective Cohort Study

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INTRODUCTION

Dental caries remains one of the most prevalent chronic diseases of childhood, often developing early and leading to significant morbidity and cost. The American Academy of Pediatric Dentistry recommends establishing a “dental home” with a first dental visit by age one to support early prevention.[1]

Studies demonstrate that earlier initiation of dental care is associated with improved outcomes, with children seen before age one experiencing lower rates of caries treatment, while delayed care is linked to increased disease burden.[2,3] Notably, children whose first dental visit occurs after age four undergo 3.58 times more dental treatments and incur up to \$360 higher costs compared to those seen earlier.[6] Caries risk is multifactorial, influenced by cariogenic bacteria, dietary habits, fluoride exposure, socioeconomic status, and prior caries experience—the strongest predictor.[4,5] Delays in care among high-risk children allow for disease progression, often resulting in more extensive treatment needs, including care under general anesthesia and increased emergency department utilization.[7,9] Early dental visits play a critical role in prevention, as they are associated with lower dmft (*decayed, missing, and filled teeth*) scores and higher rates of caries-free status, while also enabling the establishment of a dental home for individualized caregiver education and anticipatory guidance aimed at oral disease prevention and early intervention, including age-appropriate oral hygiene practices, dietary counseling, and fluoride use.[8]

Preventive strategies evaluated in prior studies include prenatal oral health counseling—focused on oral health promotion, patient education, preventive dental visits, and maternal caries management [7]—as well as the use of fluoridated toothpaste and dental sealant application. Additionally, early-stage caries management and remineralization interventions have included topical fluoride varnish, silver diamine fluoride (SDF), atraumatic restorative treatment (ART and/or SMART) [10], and neutral fluoride gel application.

Despite strong supporting evidence, there is limited real-world, clinic-based research that have used time-to-event analysis to evaluate how age at care initiation influences the timing of first carious lesion development, particularly in diverse, high-need populations. This study aims to address this gap and inform early referral practices, optimize preventive care delivery, and reduce the burden and cost of childhood dental caries.

OBJECTIVES

The purpose of this study is to evaluate whether establishing a dental home before age 3 years versus between ages 3 through 12 years is associated with a longer time to first documented operative treatment need due to dental caries. Dental Home visits were encounters that included a comprehensive oral examination, caries risk assessment, topical fluoride treatment, and/or other preventative interventions. Operative treatment needs included restorative procedures, extractions, and/or silver diamine fluoride (SDF) application and were categorized as minor or major based on procedural complexity and invasiveness.

STUDY DESIGNS AND METHODS

This was a retrospective study conducted at Montefiore Medical Center assessing patients who presented at one of the four Pediatric Dentistry clinics for their initial encounter between January 2023 to December 2023. Patients were grouped by age at the initial visit: Group 1 (G1) included ages 0 to <36 months and Group 2 (G2) ages ≥ 36 to 144 months. Inclusion criteria included successful completion of a preventive visit (establishment of a dental home) at the initial encounter and at least one subsequent follow-up visit. Exclusion criteria included underlying medical conditions or other special healthcare needs, including but not limited to autism spectrum disorder, developmental delays, cerebral palsy, and Down Syndrome, or records that lacked complete clinical notes.

Electronic Health Records were assessed via EPIC Wisdom™. Information reviewed included clinical notes, odontogram charting, and American Dental Association CPT Codes. To minimize risk associated with this study, all personal identifiers were excluded from data entry, and all subjects were assigned a study ID number. The target outcomes were the ages at the time of first documented need for treatment due to dental caries.

Additional data collected included: child behavior at dental visits as measured by Frankl behavior scores, caries risk assessment at the initial examination, and the type and extent of operative treatment rendered and/or to be rendered. Operative treatment was further subcategorized into major and minor interventions. Major interventions involved the use of local anesthesia, multi-surface restorations, stainless steel crowns, and extractions. Minor interventions included SDF application and one-surface restorations.

RESULTS

A total of 620 subjects were reviewed, with 305 patients in the early initial visit group (G1) and 315 patients in the delayed initial visit group (G2). For all subjects, 66% required operative treatment due to caries while 34% remained caries free. The mean age at the initial preventative visit was 63 months and the mean age at first need of dental treatment due to caries was 74 months.

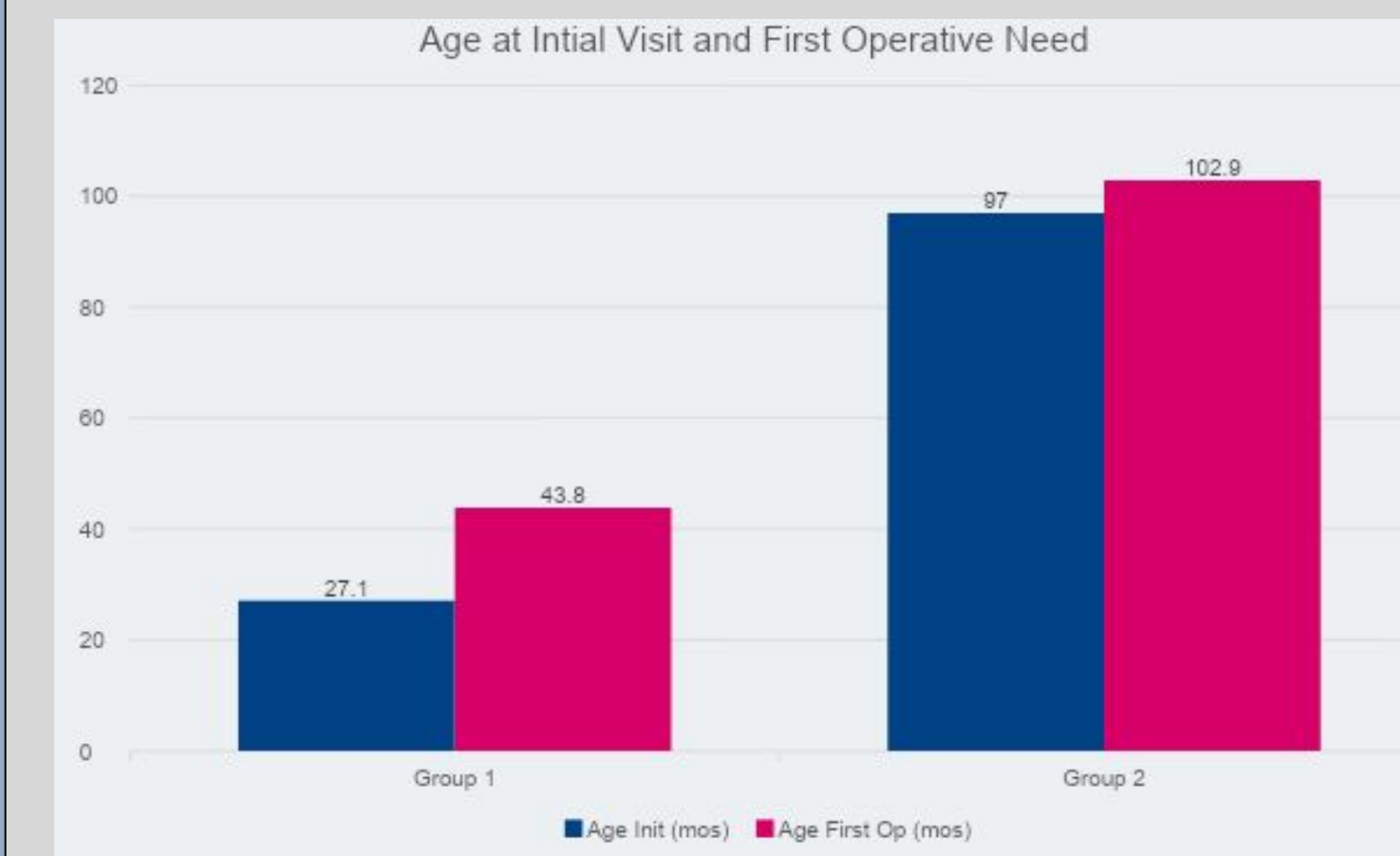
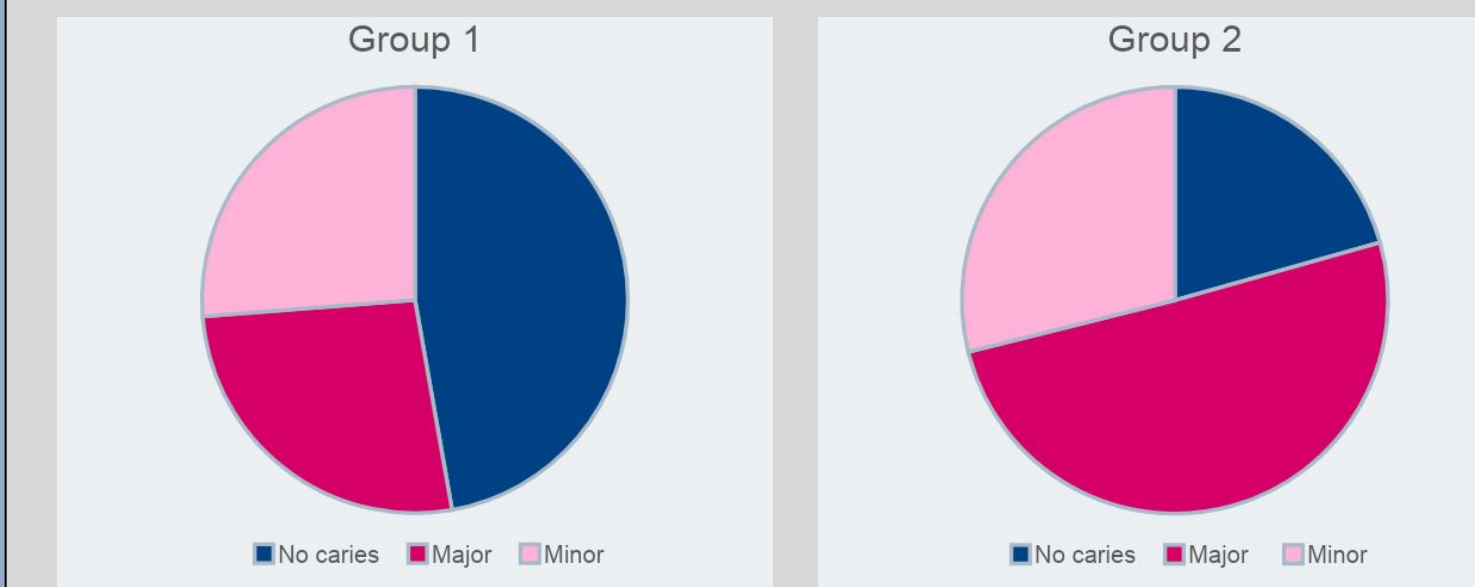
Specific to patients in G1, 52.7% required operative treatment due to caries while 47.2% remained caries-free. Of those who needed operative treatment, 26.5% were categorized as major and 26.2% were minor interventions. The mean age at the initial preventative visit was 27 months and the mean age at the first need of dental treatment due to caries was 44 months.

Specific to patients in G2, 79.3% required operative treatment due to caries while 18.5% remained caries-free. Of those who needed operative treatment, 50.4% were categorized as major and 28.8% were minor interventions. The mean age at the initial preventative visit was 97 months and the mean age at the first need of dental treatment due to caries was 102 months.

DATA ANALYSIS

Time-to-event analysis, using a log-rank test and a generalized linear model, demonstrated a significant association between age at first visit and subsequent need for operative treatment ($p < 0.001$). Patients with delayed initial visits (G2) had a markedly shorter time to treatment, with a median time of 0.03 months compared to 27 months for those seen earlier (G1). Notably, this suggests that a substantial proportion of patients in G2 required operative care at or near their first visit.

Cox proportional hazards analysis further showed that patients with delayed initial visits (G2) were **3.72 times more likely** to require operative treatment due to caries compared to those with early initial visits (G1) ($p < 0.001$). Additionally, Chi-square analysis demonstrated that patients with delayed visits (G2) were significantly more likely to require major operative interventions (79.3%; $p = 0.0076$).



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DISCUSSION

This study demonstrated a strong association between age at initial dental visit and both the timing and severity of caries-related outcomes. Children who established care earlier (<36 months) experienced a substantially longer caries-free interval compared to those with delayed visits, highlighting the protective effect of early preventive care. In contrast, patients who presented later (≥36 months) frequently required operative treatment at or near their first visit, suggesting that disease progression had already occurred prior to preventive intervention.

These findings further indicated that delayed dental visits were not only associated with earlier onset of disease but also with increased treatment complexity. Patients with delayed care were significantly more likely to require major operative interventions, reflecting more advanced disease at presentation. This underscored the limitations of relying on operative treatment alone to treat the caries process and reinforced the importance of prevention-focused care models.

The establishment of a dental home at an earlier age allowed for anticipatory guidance, risk assessment, and timely preventive interventions, which potentially delayed the onset of caries and reduced overall disease burden. Collectively, these results supported current recommendations advocating for early dental visits and highlight their role in extending the caries-free period and minimizing the need for invasive treatment.

In conclusion, delayed dental visits were associated with earlier disease onset and greater treatment severity, while early preventive care extended the caries-free interval. These findings supported the promotion of timely preventive visits as a critical strategy to improve pediatric oral health outcomes and reduce overall disease burden.

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