

# Frequency and factors associated with endodontic treatment in deciduous teeth: a study conducted at a Brazilian university

Frequência e fatores associados ao tratamento endodôntico em dentes decíduos: um estudo em uma universidade brasileira

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**How to cite:** Moraes GF, Bittencourt JM, Val ATS, Campos PSS, Bendo CB, Fernandes IB. Frequency and factors associated with endodontic treatment in deciduous teeth: a study conducted at a Brazilian university. *Braz. Dent. Sci.* 2026;29:e5048. <https://doi.org/10.4322/bds.2026.e5048>

## ABSTRACT

**Objective:** To investigate the frequency of endodontic treatment in primary teeth performed at a Brazilian university and analyze associated factors. **Material and Methods:** This retrospective cross-sectional study analyzed dental records of children aged 2 to 10 years. Children whose first appointment occurred between January 2022 and December 2024 at the Pediatric Dentistry Clinics of the School of Dentistry, Federal University of Minas Gerais (UFMG), Brazil, were included. The study was approved by the Research Ethics Committee of UFMG. The dependent variable was the performance of endodontic treatment (pulpectomy) in primary teeth. Independent variables included sociodemographic data, oral health care information, psychobehavioral data, and the presence of dental caries (ICDAS). Data were analyzed using unadjusted and adjusted Poisson regression ( $p < 0.05$ ) with IBM SPSS, version 25.0. **Results:** Of the 872 records evaluated, 76 (8.7%) patients underwent endodontic treatment during the study period. Significant associations were observed between endodontic treatment and number of family income dependents ( $PR = 1.24$ ; 95% CI = 1.04–1.48), first dental visit for curative treatment ( $PR = 3.03$ ; 95% CI = 1.09–8.33), presence of toothache ( $PR = 2.17$ ; 95% CI = 1.02–4.60), presence of dental caries ( $PR = 8.41$ ; 95% CI = 1.03–68.38), and child's age up to 7 years ( $PR = 2.86$ ; 95% CI = 1.35–5.88). **Conclusion:** The frequency of endodontic treatment in primary teeth was low and was associated with child's age, toothache, dental caries, reason for first dental consultation, and number of family income dependents.

## KEYWORDS

Child; Dental caries; Endodontics; Pulpectomy; Tooth, deciduous.

## RESUMO

**Objetivo:** Verificar a frequência do tratamento endodôntico em dentes decíduos realizado em uma universidade brasileira e analisar os fatores associados. **Material e Métodos:** Estudo transversal retrospectivo baseado na análise de prontuários odontológicos de crianças de 2 a 10 anos. Foram incluídas crianças cuja primeira consulta ocorreu entre 2022 e 2024 nas clínicas de Odontopediatria da Faculdade de Odontologia da Universidade Federal de Minas Gerais (UFMG), Brasil. O estudo foi aprovado pelo Comitê de Ética em Pesquisa da UFMG. A variável dependente foi a realização de tratamento endodôntico (pulpectomia) em dente decíduo. As variáveis independentes incluíram dados sociodemográficos, informações sobre saúde bucal, dados psicocomportamentais e cárie dentária (ICDAS). Os dados foram analisados por regressão de Poisson não ajustada e ajustada ( $p < 0,05$ ), utilizando o software IBM SPSS, versão 25.0. **Resultados:** Dos 872 prontuários avaliados, 76 (8,7%) pacientes realizaram tratamento endodôntico. Houve associação significativa entre o tratamento endodôntico e número de dependentes da renda familiar ( $RP = 1,24$ ; IC 95% = 1,04–1,48), motivo da primeira consulta odontológica para tratamento curativo ( $RP = 3,03$ ; IC 95% = 1,09–8,33), presença de dor dentária ( $RP = 2,17$ ; IC 95% = 1,02–4,60), presença de cárie dentária ( $RP = 8,41$ ; IC 95% = 1,03–68,38) e idade da criança até 7 anos ( $RP = 2,86$ ; IC 95% = 1,35–5,88). **Conclusão:** A frequência de tratamento endodôntico em dentes decíduos foi baixa e esteve associada à idade da criança, dor dentária, cárie dentária, motivo da primeira consulta odontológica e número de dependentes da renda familiar.

## PALAVRAS-CHAVE

Criança; Cárie dentária; Endodontia; Pulpectomia; Dente decíduo.

## INTRODUCTION

Inflammatory processes of the dental pulp result in vascular and cellular changes that may progress to reversible pulpitis, irreversible pulpitis, and pulp necrosis, with the progression of dental caries and dental trauma being the most common etiological factors [1]. These conditions can lead to severe complications such as pain, swelling, abscesses, fistulas, and even septicemia, directly affecting the oral health-related quality of life (OHRQoL) of the affected child [2-5]. Several factors have been reported to be associated with pulpal involvement, including socio-demographic characteristics (sex, parent's schooling, type of school, guardian's age, and number of children in the family), clinical characteristics (presence of visible dental biofilm and cavitated lesions), and access-related determinants such as delayed utilization of dental services and seeking dental care only for curative reasons [6-10]. These variables are essential for understanding the underlying causes that contribute to pulpal involvement.

In this context, endodontic treatment is essential to clean and shape the root canals, control infection, preserve primary teeth until their natural exfoliation, and maintain function, arch integrity, and the health of supporting tissues [9-12]. Nevertheless, this procedure presents technical challenges, including the anatomical complexity of root canals, the management of child behavior, and extended clinical time [13].

The most recent National Oral Health Survey [14] reported that 41.18% of five-year-old children have untreated dental caries. In addition, 13.98% present clinical consequences of untreated caries, such as pulpal involvement, fistula, abscess, or ulceration, and 10% require emergency care [15]. These findings indicate a substantial demand for more complex therapies, such as endodontic treatment. In this context, dental school clinics play a fundamental role in public health by providing specialized and free dental care services.

Socioeconomic conditions are recognized as important determinants of oral health and access to dental care [15]. Evidence from Brazil demonstrates that income, educational level, and household living conditions influence both the utilization of dental services and oral health outcomes, contributing to persistent inequalities in access to preventive and curative dental care [16,17]. These disparities may delay treatment seeking and increase the likelihood of advanced oral conditions requiring more complex

interventions. Therefore, studies evaluating dental records are important to investigate the frequency of endodontic treatment in primary teeth and to identify the factors associated with its occurrence in the Brazilian population.

Despite the high prevalence of untreated dental caries and its clinical consequences, there is a scarcity of studies assessing the frequency of endodontic treatment in primary teeth in Brazil. Understanding the profile of children requiring these procedures and the factors related to their indication may contribute to the planning of preventive and therapeutic strategies, as well as support public oral health policies aimed at reducing oral health inequalities.

Thus, endodontic treatment in primary teeth represents a major challenge in pediatric dental practice. Providing detailed data on its frequency and associated factors will improve understanding of the needs and challenges faced by pediatric dentists. This knowledge may not only enhance clinical practices but also inform public health policies and oral health programs. Accordingly, this study aims to assess the frequency of endodontic treatment in primary teeth at a Brazilian university and analyze the factors associated with its provision.

## MATERIALS AND METHODS

### Ethical considerations

This study was submitted to and approved by the Research Ethics Committee of the Federal University of Minas Gerais (COEP-UFMG) (CAAE: 7.027.546). The Informed Consent Form (ICF) was signed by the parents or legal guardians of the participating children during their first appointment at the university. The consent authorized the use of information from the children's dental records for research purposes, ensuring data confidentiality and use solely for academic and scientific purposes. All dental records were analyzed individually, and all data of interest for the study were collected directly from the records.

### Study design, population, and eligibility criteria

This is a retrospective cross-sectional study conducted at the pediatric dentistry clinics of the School of Dentistry (FAO) of the Federal University of Minas Gerais (UFMG), located in Belo Horizonte, the capital of the state of Minas Gerais in the Southeast region of Brazil.

The municipality is situated in the central region of the state, has a population of 2,375,151 inhabitants, and a Human Development Index (HDI) of 0.810 (IBGE, 2010).

Dental records of children aged 2 to 10 years who had their first appointment between January 2022 and December 2024 at the FAO UFMG pediatric dentistry clinics were included. Records in which endodontic treatment was performed due to dental caries were also considered. Records with incomplete data that could compromise the analysis were excluded.

The study was reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [18].

### Data collection and variables

Data were collected from the dental records by two undergraduate dental students who were specifically trained for this study. The training was conducted by the study coordinator and included detailed instructions regarding the variables of interest, data extraction procedures, and database completion. All information was entered into a standardized database. Both researchers followed the same standardized data collection protocol to ensure consistency and minimize information bias.

#### *Dependent variable*

The dependent variable was the performance of pulpectomy in primary teeth (yes or no), using either the conventional instrumental technique or the non-instrumental technique (Lesion Sterilization and Tissue Repair – LSTR). This variable was recorded based on the treatment progress form included in the patient's dental record.

#### *Independent variables*

The independent variables included socioeconomic factors such as the child's age (2–7 years and older than 7 years), categorized according to the median age of the study population, sex (male or female), maternal education ( $\leq 8$  years of schooling,  $> 8$  years), number of dependents in the household, and number of siblings ( $\leq 1$  sibling,  $> 1$  sibling). Clinical factors were also considered, including the reason for the first visit to the FAO clinics (curative treatment or prevention), presence of toothache (yes or no), age at which the child began using

fluoridated toothpaste (in months), use of dental floss (yes or no), and the presence of dental caries according to the International Caries Detection and Assessment System (ICDAS), with caries defined as white spot lesions (ICDAS  $\geq 1$ ) and sound teeth defined as ICDAS = 0. Finally, data on psychobehavioral factors (child behavior during dental care) were collected using the Frankl scale, in which behavior is classified as definitely positive, positive, negative, or definitely negative [19]. For this study, behavior was dichotomized as positive (definitely positive and positive) or negative (negative and definitely negative).

### Statistical analysis

The data were organized into a database using IBM SPSS Statistics software (IBM Corp., Armonk, NY, USA), version 25. Descriptive analyses were performed using absolute and relative frequencies for the variables. Unadjusted and adjusted Poisson regression analyses were conducted to assess the association between the independent variables and the performance of endodontic treatment. Associations with a p-value  $< 0.20$  in the unadjusted analysis were included in the adjusted analysis (final model). Associations with a p-value  $< 0.05$  were considered statistically significant.

## RESULTS

Of the 1,478 dental records available between January 2022 and December 2024, 606 (41%) were excluded due to incomplete data. A total of 872 records were included and analyzed (Figure 1). Most patients were male (50.5%), with a mean age of  $7.14 \pm 2.575$  years (Table I). Seventy-six (8.7%) patients underwent endodontic treatment during the study period. Among the endodontically treated teeth, 18.4% ( $n = 14$ ) were anterior teeth, while 43.4% ( $n = 33$ ) underwent treatment using the non-instrumental technique.

Unadjusted Poisson regression showed that the reason for the first visit ( $p < 0.001$ ), reported toothache ( $p < 0.001$ ), presence of dental caries ( $p < 0.001$ ), behavior during the appointment ( $p < 0.001$ ), child's age ( $p < 0.001$ ), use of dental floss ( $p = 0.012$ ), and age at initiation of fluoridated toothpaste use ( $p = 0.025$ ) were associated with endodontic treatment (Table II).

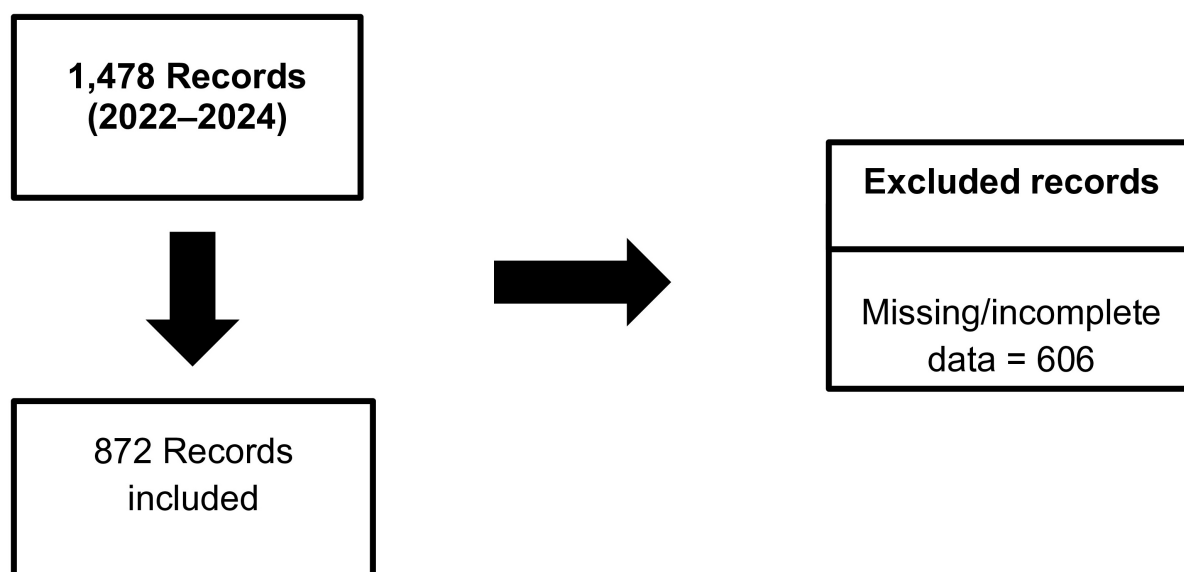


Figure 1 - Flowchart of the selection of eligible records.

Table I - Sample characteristics

| Variables                                     | N (%)          |
|-----------------------------------------------|----------------|
| <b>Maternal Education</b>                     |                |
| ≤8 years of schooling                         | 149 (19.1%)    |
| >8 years of schooling                         | 631 (80.9%)    |
| <b>Number of dependents in the household*</b> | 4.02 ± 1.151   |
| <b>Child's age</b>                            |                |
| 2-7 years                                     | 469 (53.8%)    |
| Older than 7 years                            | 403 (46.2%)    |
| <b>Sex</b>                                    |                |
| Male                                          | 439 (50.5%)    |
| Female                                        | 431 (49.5%)    |
| <b>Number of siblings</b>                     |                |
| ≤1 sibling                                    | 361 (51.0%)    |
| >1 sibling                                    | 347 (49.0%)    |
| <b>Fluoridated toothpaste *</b>               | 30.05 ± 23.049 |
| <b>Dental floss</b>                           |                |
| No                                            | 471 (54.7%)    |
| Yes                                           | 390 (45.3%)    |
| <b>The reason for the first visit</b>         |                |
| Curative treatment                            | 470 (57.7%)    |
| Prevention                                    | 344 (42.3%)    |
| <b>Child behavior</b>                         |                |
| Negative/ definitely negative                 | 136 (15.8%)    |
| Positive/ definitely positive                 | 723 (84.2%)    |
| <b>Toothache</b>                              |                |
| Yes                                           | 442 (52.7%)    |
| No                                            | 397 (47.3%)    |
| <b>Dental caries</b>                          |                |
| Yes (ICDAS≥1)                                 | 556 (68.0%)    |
| No (ICDAS=0)                                  | 262 (32.0%)    |

\*Mean (standard deviation).

**Table II** - Unadjusted and adjusted analysis of the association between independent variables and endodontic treatment

| Variables                             | No N (%)         | Endodontic treatment |                        |         |                      |         |
|---------------------------------------|------------------|----------------------|------------------------|---------|----------------------|---------|
|                                       |                  | Yes N (%)            | Unadjusted PR (95% CI) | p-value | Adjusted PR (95% CI) | p-value |
| Socioeconomic variables               |                  |                      |                        |         |                      |         |
| Maternal Education                    |                  |                      |                        |         |                      |         |
| ≤8 years of schooling                 | 131 (87.9)       | 18 (12.1)            | 1.54 (0.92-2.63)       | 0.105   | 1.35 (0.73-2.44)     | 0.340   |
| >8 years of schooling                 | 582 (92.2)       | 49 (7.8)             | 1.00                   |         | 1.00                 |         |
| Number of dependents in the household | 3.99 (1.103) *   | 4.25 (1.562) *       | 0.17 (0.96-1.42)       | 0.116   | 1.24 (1.04-1.48)     | 0.016   |
| Child-related variables               |                  |                      |                        |         |                      |         |
| Child's age                           |                  |                      |                        |         |                      |         |
| 2-7 years                             | 404 (86.1)       | 65 (13.9)            | 5.00 (2.70 -10.0)      | <0.001  | 2.86 (1.35-5.88)     | 0.006   |
| Older than 7 years                    | 392 (97.3)       | 11 (2.7)             | 1.00                   |         | 1.00                 |         |
| Sex                                   |                  |                      |                        |         |                      |         |
| Male                                  | 401 (91.3)       | 38 (8.7)             | 1.01 (0.65-1.56)       | 0.970   | -                    | -       |
| Female                                | 394 (91.4)       | 37 (8.6)             | 1.00                   |         |                      |         |
| Number of siblings                    |                  |                      |                        |         |                      |         |
| ≤1 sibling                            | 326 (90.3)       | 35 (9.7)             | 1.02 (0.65-1.61)       | 0.933   | -                    | -       |
| >1 sibling                            | 314 (90.5)       | 33 (9.5)             | 1.00                   |         |                      |         |
| Fluoridated toothpaste                | 30.58 (23.503) * | 24.67 (17.034) *     | 0.99 (0.98-1.00)       | 0.025   | 0.99 (0.99-1.00)     | 0.199   |
| Dental Floss                          |                  |                      |                        |         |                      |         |
| No                                    | 420 (89.2)       | 51 (10.8)            | 1.84 (1.14-2.95)       | 0.012   | 1.40 (0.85-2.31)     | 0.182   |
| Yes                                   | 367 (94.1)       | 23 (5.9)             | 1.00                   |         | 1.00                 |         |
| The reason for the first visit        |                  |                      |                        |         |                      |         |
| Curative Treatment                    | 404 (86.0)       | 66 (14.0)            | 9.03 (3.67-22.25)      | <0.001  | 3.03 (1.09 -8.33)    | 0.033   |
| Prevention                            | 338 (98.3)       | 06 (1.7)             | 1.00                   |         | 1.00                 |         |
| Child behavior                        |                  |                      |                        |         |                      |         |
| Negative/definitely negative          | 98 (72.1)        | 38 (27.9)            | 5.46 (3.61-8.26)       | <0.001  | 1.59 (0.94-2.70)     | 0.086   |
| Positive/ definitely positive         | 686 (94.9)       | 37 (5.1)             | 1.00                   |         | 1.00                 |         |
| Toothache                             |                  |                      |                        |         |                      |         |
| Yes                                   | 380 (86.0)       | 62 (14.0)            | 5.57 (2.90-10.71)      | <0.001  | 2.17 (1.02- 4.60)    | 0.043   |
| No                                    | 387 (97.5)       | 10 (2.5)             | 1.00                   |         | 1.00                 |         |
| Dental caries                         |                  |                      |                        |         |                      |         |
| Yes (ICDAS≥1)                         | 485 (87.2)       | 71 (12.8)            | 16.73(4.13-67.67)      | <0.001  | 8.41 (1.03-68.38)    | 0.046   |
| No (ICDAS=0)                          | 260 (99.2)       | 02 (0.8)             | 1.00                   |         | 1.00                 |         |

Poisson regression; PR = Prevalence Ratio; CI = Confidence Interval. \*Mean (standard deviation). Bold values = statistically significant.

In the final model, statistically significant associations were observed between a higher number of household dependents (PR = 1.24; 95% CI = 1.04–1.48; p=0.016), the reason for the first visit being curative treatment (PR = 0.33; 95% CI = 0.12–0.91; p=0.033), presence of toothache (PR = 2.17; 95% CI = 1.02–4.60; p=0.043), presence of dental caries (PR = 8.41; 95% CI = 1.03–68.38; p=0.046), and younger child age (PR = 2.86; 95% CI = 1.35–5.88; p=0.006) with the performance of endodontic treatment (Table II).

## DISCUSSION

The present study assessed the frequency of endodontic treatments in primary teeth at a Brazilian university and analyzed the factors associated with the need for such treatment. Children from families with a higher number of household dependents, those younger than 7 years of age, whose first visit was for curative treatment, with a history of toothache, and the presence of dental caries were more likely to undergo endodontic treatment in the primary dentition.

The frequency of endodontic treatment in the primary dentition observed in this study was 8.7%, similar to previously reported findings in the literature [20,21]. In a study conducted at a university clinic in Nigeria, 9.6% of the children treated required endodontic therapy, either due to caries or trauma, with a smaller proportion receiving treatment in primary teeth [20]. As in the present study, the Nigerian research did not identify any sex predilection, but it evaluated treatment frequency by tooth, reporting that the first and second primary molars had the highest rates of endodontic treatment. Similarly, another Brazilian study conducted at a university clinic in João Pessoa reported an 11% prevalence of pulpal therapy in primary teeth [21]. Therefore, the frequency of endodontic treatment observed in this study is consistent with national and international data, highlighting that pulpal involvement in children remains a significant challenge for oral health. Despite the low frequency, the need for complex interventions, such as endodontic treatment in primary teeth, persists. These findings underscore the importance of expanding access to dental care services within the scope of the Brazilian Unified Health System (SUS).

In the present study, the presence of other carious teeth in the child was associated with the performance of endodontic treatment, which corroborates the findings of previous studies [20,21]. This finding can be explained by the study by Lopes et al. (2021) [6], which reported that early childhood caries is associated with an increased risk of caries incidence and progression, with possible future pulpal involvement. Thus, children with a history of caries are more likely to require endodontic intervention due to the consequences of caries progression.

An association was also identified in the present study between the number of family income dependents and the performance of endodontic treatment. Habib et al. (2020) [22] used the PUFA/pufa index to assess pulpal involvement in teeth with untreated carious lesions and found that children from lower-middle and low socioeconomic classes were more likely to present pulpal involvement. Other studies have also demonstrated an association between larger families and poorer oral health-related quality of life (OHRQoL) in children [23]. These findings may be explained by the fact that a greater number of household members implies division of financial resources, which can hinder the family's access

to healthcare services, including dental care. Furthermore, the study by Park et al. (2023) [24] showed that larger families exhibited oral health risk factors such as dental caries, mainly due to inadequate oral hygiene practices. This may be related to a lack of time or limited financial and material resources for caregivers to ensure proper oral care and healthy dietary habits for all children in the household.

Another important finding of this research was the association between endodontic treatment and the variables toothache and reason for the first dental visit being curative treatment. This finding is consistent with the study by Gonçalves et al. (2024) [25], which showed that the demand for dental services for preschool children occurs mainly for the management of oral diseases, such as dental caries. Consequently, when caregivers finally seek care, the clinical condition has often progressed to pulpal involvement, requiring more invasive procedures such as endodontic treatment [26]. This finding is plausible, as some caregivers do not perceive the maintenance of the primary dentition as important because it will eventually be replaced; thus, they tend to seek dental care only when the child already presents clinical symptoms such as pain [20,25].

Similar to the study by Ajayi et al. (2009) [27], which identified a higher prevalence of endodontic treatment among patients aged 2 to 5 years, the present study confirmed that children under 7 years of age were more likely to undergo this procedure. The higher frequency observed among children aged 2 to 5 years may be related to the fact that, in this age group, primary teeth are still far from the exfoliation period and have less than one-third of their roots resorbed. This condition favors the indication of endodontic treatment instead of extraction, allowing the maintenance of the tooth until its natural exfoliation [5,28].

Despite the relevant findings, some aspects should be further explored in future investigations. This study presents limitations inherent to its retrospective nature, based on the analysis of previously completed dental records from the pediatric dentistry clinic. This method may lead to variability in the records due to the lack of standardized annotations and the presence of incomplete data. A substantial number of records were excluded due to missing information, particularly regarding socioeconomic variables, ICDAS scores and signed informed consent forms.

Consequently, some cases may not have been identified or classified correctly, potentially leading to an underestimation of the frequency of endodontic treatment in primary teeth. Another limitation is the exclusion of trauma-related endodontic cases, as children with traumatic dental injuries were treated through a university extension program and were therefore not included in the analyzed records. Considering that dental trauma is a common indication for endodontic treatment in primary teeth, this exclusion may have introduced significant selection bias and further contributed to an underestimation of the true frequency of endodontic treatment in the study population. Furthermore, these results cannot be generalized to the entire population, as they have limited external validity and are more applicable to populations seeking care in health services linked to higher education institutions. Therefore, studies with representative samples are warranted.

The findings of this study have important implications for both dental practice and public health policy. For clinical practice, the data highlight the need for greater attention to high-risk groups, particularly younger and more vulnerable patients, by emphasizing preventive education and early diagnosis. Strategies such as health education programs directed at caregivers and the strengthening of the relationship between dental professionals and families may increase the frequency of preventive visits, thereby reducing the incidence of pulpal involvement and, consequently, the need for endodontic interventions. From a public policy perspective, the results underscore the importance of developing oral health programs targeting early childhood, especially in socially vulnerable regions. Furthermore, the findings reinforce the crucial role of university dental clinics in providing specialized and free dental care services.

## CONCLUSION

The frequency of endodontic treatments performed between 2022 and 2024 was low, corresponding to 8.7% of the patients.

Endodontic treatment in primary teeth was associated with clinical and sociodemographic factors, such as the presence of dental caries, history of toothache, younger child age, first dental visit for curative treatment, and a higher number of family income dependents.

These findings highlight the importance of early preventive dental care, timely diagnosis of carious lesions, and improved access to oral health services, particularly for socially vulnerable children, in order to prevent disease progression and reduce the need for complex interventions such as endodontic treatment in primary teeth.

## Acknowledgements

This study was supported by the Coordination for the Improvement of Higher Education Personnel (CAPES), Ministry of Education; National Council for Scientific and Technological Development (CNPq), Ministry of Science, Technology.

## Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## Author's Contributions

GFM, JMB, IBF: Conceptualization. IBF, JMB: Methodology. JMB: Formal Analysis. GFM, ATSV: Investigation. GFM, ATSV: Data Curation. GFM, IBF, JMB: Writing – Original Draft Preparation. JMB, IBF, PSSLC, CBB: Writing – Review & Editing.

## Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

## Funding

The authors declare supported by the Coordination for the Improvement of Higher Education Personnel (CAPES), Ministry of Education; National Council for Scientific and Technological Development (CNPq), Ministry of Science, Technology.

## Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of: Research Ethics Committee of the Federal University of Minas Gerais (COEP-UFMG), This study protocol was reviewed and approved by COEP-UFMG, approval number CAEE: 7.027.546.

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Editor-in-chief: Sergio Eduardo de Paiva Gonçalves

Editor: Cristiane Meira Assunção

Date submitted: 2025 Oct 29

Accept submission: 2026 Jun 25