MICROABRASIVE TREATMENT WITH ANTIVET® FOR THE REMOVAL OF DENTAL FLUOROSIS STAINS: A SCOPING REVIEW

TRATAMENTO MICROABRASIVO COM O ANTIVET® PARA REMOÇÃO DE MANCHAS DE FLUOROSE DENTÁRIA: UMA REVISÃO DE ESCOPO

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Received: 05/22/2026. **Accept:** 06/23/2026

ABSTRACT

Dental fluorosis (DF) is a structural enamel dysplasia that causes aesthetic and psychological impacts on the affected population. In such cases, Antivet® emerges as an alternative for the removal of these stains. Its mechanism of action involves an ionic exchange process in which the enamel is exposed to an acidic solution that reacts with the fluoride present in apatite crystals. However, there is a lack of studies comparing its clinical efficacy with that of other materials currently available on the market. Therefore, this study aimed to synthesize the scientific evidence regarding the clinical efficacy of the Antivet® kit (composed of 21% hydrochloric acid and a calcium hydroxide-based solution with pH >12) in the treatment of DF. This was a scoping review conducted according to the methods described by the JBI. The established criteria were guided by the PRISMA-ScR statement. The study protocol was registered in the OSF. An electronic search was performed in PubMed/MEDLINE, SciVerse Scopus, Web of Science, LILACS, and EMBASE. Combinations of the Health Sciences Descriptors "Enamel microabrasion," "Hydrochloric acid," "Fluorosis, dental," and "Calcium hydroxide" were adapted for each database using the Boolean operators "and" and/or "or." A total of six studies were included. The clinical efficacy of Antivet® was compared with other microabrasive products, such as Opalustre®, Whiteness HP Maxx 35%®, and OpalCups Bristles®. Antivet® showed superior results in terms of aesthetic satisfaction and reduced dentin hypersensitivity. Thus, Antivet® demonstrated greater clinical efficacy compared with other microabrasive methods.

KEYWORDS: Hydrochloric acid; Dental fluorosis; Enamel microabrasion.

RESUMO

A fluorose dentária (FD) é uma displasia estrutural do esmalte dentário, que gera impacto estético e psicológico na população afetada. Nesses casos, o Antivet® surge como uma alternativa para a remoção dessas manchas. Seu mecanismo de ação envolve uma troca iônica, na qual o esmalte é exposto a uma solução ácida que reage com o flúor presente nos cristais de apatita. Contudo, há uma limitação de estudos que comparem a sua eficácia clínica com as de outros materiais já presentes no mercado. Este estudo teve como objetivo sintetizar as evidências científicas sobre a eficácia clínica do kit Antivet® (composto por ácido clorídrico a 21% e solução à base de hidróxido de cálcio com pH >12) no tratamento da FD. Trata-se de uma revisão de escopo, conduzida de acordo com os métodos descritos pelo JBI. Os critérios estabelecidos foram guiados pelo PRISMA-ScR. O protocolo da pesquisa foi registrado no OSF. Uma busca eletrônica no PubMed/ MEDLINE, *SciVerse Scopus, Web of Science*, LILACS e EMBASE foi idealizada. Combinações dos descritores em ciências da saúde *"Enamel microabrasion", "Hydrochloric acid", "Fluorosis, dental"* e *"Calcium hydroxide"* foram adaptadas para cada banco de dados por meio dos operadores booleanos *"and"* e/ou *"or"*. Ao todo, seis estudos foram incluídos. A eficácia clínica do Antivet® foi comparada a outros produtos microabrasivos, como Opalustre®, Whiteness HP Maxx 35%® e OpalCups Bristles®. O Antivet® apresentou resultados superiores em termos de satisfação estética e sensibilidade dentária. Desse modo, o Antivet® demonstrou maior eficácia clínica em comparação a outros métodos microabrasivos.

PALAVRAS-CHAVE: Ácido clorídrico; Fluorose dental; Microabrasão do esmalte.

1. INTRODUCTION

Dental fluorosis (DF) is a structural dysplasia of dental enamel that causes significant aesthetic and psychological impacts on the affected population[1]. It is characterized by the presence of stains ranging from white to brown, as well as enamel defects[2,3].

This condition develops predominantly during the first ten years of life, a critical period for dental enamel formation[4]. The prevalence of DF represents a public health issue in several countries, including Brazil, where approximately 16.7% of 12-year-old children are affected, predominantly in its mild form[5]. Fluoridated water and toothpaste are the main sources of fluoride administration for caries prevention; however, their inappropriate use may contribute to the development of fluorosis[6].

The therapeutic approach for the treatment of DF depends directly on the clinical severity of the lesions and on an accurate diagnosis[1]. In mild cases,

conservative procedures such as tooth bleaching and enamel microabrasion are frequently indicated because of their minimally invasive nature and satisfactory aesthetic outcomes[7]. In moderate and severe cases, restorative procedures may be required, including composite resin restorations, veneers, or aesthetic crowns[8,9].

Among conservative approaches, enamel microabrasion stands out as an effective technique for removing superficial stains associated with DF[2]. The procedure combines the application of hydrochloric acid at different concentrations with abrasive agents, promoting controlled removal of the superficial enamel layer[7].

In addition to mechanical wear, the process involves chemical ionic exchange reactions in which the enamel is exposed to an acidic solution that reacts with the fluoride present in apatite crystals, resulting in the formation of soluble salts that are easily removed from the dental surface[4].

In this context, Antivet® has emerged as a therapeutic alternative for the treatment of DF, consisting of 21% hydrochloric acid associated with a calcium hydroxide-based solution[10]. Its mechanism of action involves an ionic exchange process in which the enamel is exposed to an acidic solution that reacts with the fluoride present in apatite crystals[8]. After stain removal, a calcium hydroxide solution is applied to neutralize acidic residues, followed by water rinsing[6].

However, there is a scarcity of studies comparing its clinical efficacy with that of other materials already available in the dental market. Therefore, this study aimed to synthesize the available scientific evidence regarding the clinical efficacy of Antivet® in the treatment of DF.

2. MATERIALS AND METHODS

Study Design and Protocol

This study is a scoping review developed in accordance with the methodological recommendations proposed by the *Joanna Briggs Institute* (JBI). The conduct and reporting of the results followed the criteria established by the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR). The study protocol was previously registered on the Open Science Framework platform (https://doi.org/10.17605/OSF.IO/QNZ67).

Search Information and Search Strategy

For the development of this study, the following guiding research question was formulated: "Does the use of the microabrasive technique with the Antivet® kit present clinical outcomes similar to those of other materials currently available in the dental market?" The research question was structured based on the PCC strategy (Population, Concept, and Context), as recommended by the Joanna Briggs Institute protocol.

The population (P) consisted of individuals presenting dental stains and aesthetic enamel alterations, especially those related to dental fluorosis (DF). The concept (C) involved the use of Antivet® as a microabrasive treatment for the removal of dental stains and improvement of enamel aesthetics. The context (C) encompassed clinical outcomes related to treatment efficacy, including stain reduction, postoperative sensitivity, aesthetic satisfaction, and preservation of dental structure.

Subsequently, descriptors, truncations, and combinations of the terms "Enamel Microabrasion," "Hydrochloric Acid," "Fluorosis, Dental," and "Calcium Hydroxide" were adapted according to the specificities of each database, using the Boolean operators "AND" and "OR" to optimize the search strategy. All identified references were exported to EndNote software, in which the studies were organized and duplicate records removed during the search process.

Eligibility Criteria

Peer-reviewed clinical trials, case reports, case series, and in vitro studies related to the topic were included. On the other hand, studies focusing on stain removal through enamel microabrasion associated with orthodontic appliances, studies involving teeth with carious lesions, literature reviews, theses and/or master's or doctoral dissertations, editorials, pilot studies, duplicate studies, conference proceedings, epidemiological studies, unavailable full-text articles, cohort studies, and cross-sectional studies were excluded.

Databases

To identify eligible studies for this review, an electronic search was performed in the PubMed/MEDLINE, SciVerse Scopus, Web of Science, Latin American and Caribbean Health Sciences Literature (LILACS), and EMBASE databases. Additionally, gray literature (Google Scholar) was consulted to identify potential studies not retrieved from the previously selected databases. The searches were conducted from May 20 to August 31, 2025, with an updated search performed on May 1, 2026.

Study Selection and Assessment

The examiners were previously trained to apply the study selection criteria in two stages. In the first stage, titles and abstracts of all articles identified in the databases were analyzed to select potentially eligible studies for full-text reading. In the second stage, the previously selected articles were fully assessed according to the inclusion and exclusion criteria established for this review.

Two reviewers independently and blindly participated in both stages of the selection process. Furthermore, during the second stage, a manual search of the reference lists of the included studies was conducted to identify potentially relevant articles not retrieved in the initial electronic searches. In cases of disagreement between reviewers at any stage of the

evaluation process, the studies were discussed between the two examiners and a third researcher until consensus was reached.

Table 1. Summary of the Included Studies.

Author/Year	Study Design	Sample	Technique/Time	Outcomes
Diab; Elhaddad *et al.*, 2025[12]	*In vitro*	120 extracted, caries-free human teeth	Samples were stained by immersion in coffee or cola beverage solutions at 37 °C for 8 hours daily over 5 days, with intermediate storage in artificial saliva, and subsequently subdivided (n = 15).	All tested microabrasive materials effectively improved tooth color and enamel microhardness. Antivet® appeared to be a viable alternative to hydrochloric acid-based products.
Aguilera *et al.*, 2023[11]	*In vitro*	12 teeth with grade IV DF	Microabrasion with Opalustre® for 60 seconds in 10 intervals. Antivet®: performed for 10 minutes. Whiteness HP Maxx 35%®: evaluated 7 days after treatment.	Antivet® showed more favorable color changes, as well as increased calcium (Ca) and phosphorus (P) concentrations.
Kabil; Khalil, 2023[13]	Randomized clinical trial	24 patients with grade I hypomineralization	Antivet®: 1–5 minutes per tooth. OpalCups®: applied for 60 seconds.	The product was effective in the treatment of discolored enamel.
Bauer *et al.*, 2022[10]	Case report	12-year-old patient with grade IV DF	30 seconds on each tooth surface, repeated 3 times.	Satisfactory results were achieved, with elimination of stains.
Acosta Enrique *et al.*, 2022[14]	Case series	16 patients with DF	5 minutes and, if necessary, repeated 3 times per tooth.	Effective and reliable for removing DF stains without causing enamel wear.
Panday *et al.*, 2021[15]	Case series	Teeth affected by DF	1–5 minutes per tooth.	Sensitivity was significantly lower with the product.

Data Extraction and Organization

A standardized matrix was developed in Microsoft Excel version 2021 to assist in the mapping and organization of data from the included studies. The following variables of interest were extracted and tabulated: authors, year of publication, study design, sample characteristics, Antivet® application protocol, evaluated parameters, main findings, and study conclusions.

To synthesize the essential elements of the selected publications, an analytical-descriptive approach was employed for content evaluation of the articles. This process involved a detailed analysis of the included studies, allowing the identification, organization, and development of thematic categories derived from the evidence found in the literature.

The main outcomes evaluated in this review involved the clinical efficacy of microabrasive treatment with Antivet®, including reduction of dental stains, aesthetic improvement, postoperative sensitivity, and preservation of dental enamel structure.

Study Selection

Initially, 459 studies were identified across the selected databases. After screening titles and abstracts according to the previously established eligibility criteria, 103 publications were considered potentially relevant and selected for full-text assessment. Ultimately, 06 studies met all eligibility criteria and comprised the final sample for analysis and synthesis of the results. The study selection process is detailed in Figure 1.

Characteristics of Studies

The included studies demonstrated that treatment with Antivet® yielded satisfactory clinical outcomes in the removal of dental stains, with maintenance of aesthetic results throughout the follow-up period. In addition to the visual improvement of the lesions, significant preservation of dental structure was observed, reinforcing the minimally invasive nature of the microabrasive technique.

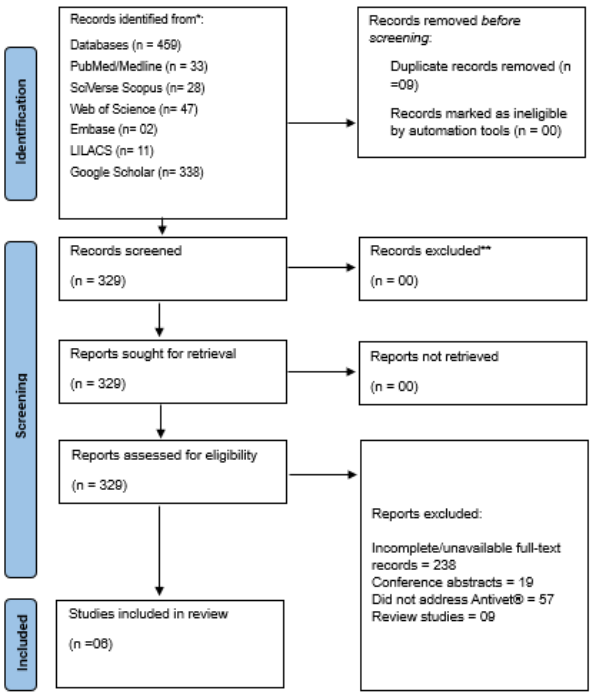

Figure 1 – Flow diagram adapted from PRISMA (2020).

Some studies reported clinically favorable color changes following treatment with Antivet®, as well as increased concentrations of calcium (Ca) and phosphorus (P) on the enamel surface, suggesting a potential effect related to remineralization and structural stability of the dental tissue[11,12].

Regarding methodological design, the studies showed considerable diversity, including case reports, case series, in vivo studies, and randomized clinical trials. The samples consisted predominantly of teeth

affected by dental fluorosis and grade I hypomineralization.

Furthermore, some studies compared Antivet® with other therapeutic strategies for the treatment of dental stains. The application protocols also varied, particularly with respect to the contact time of the product with the enamel surface, which ranged from 1 to 5 minutes, with the application generally performed using a cotton pellet (Table 1).

3. DISCUSSION

The findings of this scoping review demonstrated that microabrasive treatment with Antivet® presents promising results for the removal of dental stains associated with dental fluorosis (DF) and other superficial enamel alterations. Overall, the analyzed studies showed significant aesthetic improvement, visible stain reduction, and high levels of patient satisfaction following treatment, reinforcing the clinical potential of this technique as a minimally invasive approach.

Diab, Elhaddad *et al.* (2025)[12] observed that all evaluated microabrasive materials could improve tooth color and increase enamel microhardness after exposure to staining challenges involving coffee and cola-based soft drinks. However, the authors highlighted that Antivet® exhibited satisfactory performance comparable to traditional hydrochloric acid-based products, suggesting its potential as a less aggressive alternative. These findings are particularly relevant considering that conventional microabrasion protocols frequently employ highly acidic compounds, which may lead to excessive enamel wear and increased surface roughness[16].

Corroborating these findings, Kabil and Khalil, 2023[13] demonstrated that Antivet® promoted more favorable color changes when compared with Opalustre® and bleaching with 35% hydrogen peroxide. Furthermore, the authors identified increased concentrations of calcium and phosphorus after treatment, indicating a possible remineralizing effect or, at least, a lower demineralizing potential of the product.

In this context, conservative therapies have been widely valued due to their ability to provide satisfactory aesthetic outcomes while minimizing loss of dental structure[16]. The findings of this review support this perspective, as Antivet® demonstrated the ability to remove superficial enamel alterations while preserving the remaining dental structure to the greatest extent possible[13].

From a clinical standpoint, the results also reinforce the effectiveness of Antivet® in the treatment of DF. In the randomized clinical trial conducted by Kabil & Khalil (2023)[13], the material proved effective in reducing enamel stains in patients with hypomineralization, using relatively short application times. The observed effectiveness suggests that the product may be incorporated as a conservative approach into therapeutic protocols focused on dental aesthetics, especially in mild and moderate cases.

Bauer *et al.* (2022)[10], in a case report involving a 12-year-old patient with grade IV dental fluorosis, observed satisfactory stain removal after successive short applications of the product. Similarly, Acosta Enrique *et al.* (2022)[14], in a case series involving 16 patients with dental fluorosis, reported that Antivet® was effective and reliable in stain removal without causing significant enamel wear.

Another relevant aspect observed was the low occurrence of dentin hypersensitivity. Panday *et al.* (2021)[15] reported a significant reduction in sensitivity after product use, suggesting that Antivet® may provide better clinical tolerability when compared with conventional microabrasion and bleaching techniques. This factor has substantial clinical relevance, as postoperative hypersensitivity represents one of the main limitations of aesthetic treatments involving superficial enamel wear and high-concentration bleaching agents[16-19].

Another important finding identified in the studies was the improvement in the superficial chemical properties of enamel following the use of Antivet®, particularly due to the increased concentrations of calcium and phosphorus. Although the mechanisms involved have not yet been fully clarified, it is believed that the controlled action of hydrochloric acid associated with calcium hydroxide contributes to a more homogeneous surface that is less susceptible to pigment retention and optical irregularities[11,13]

Contributions and Limitations

As a scientific contribution, this study expands the available evidence regarding the use of Antivet® for the treatment of dental stains associated with fluorosis, demonstrating satisfactory clinical outcomes related to aesthetic improvement and removal of superficial enamel alterations. Furthermore, the analyzed studies suggest that the product may offer an important advantage related to the lower occurrence of postoperative sensitivity, which is highly relevant to patient acceptance and comfort during treatment.

Despite the promising findings, some limitations should be considered. These include the high cost of the product, its still limited availability in certain clinical settings, and the limited number of studies with robust methodologies and long-term follow-up. Additionally, heterogeneity was observed among the clinical protocols employed, as well as differences in aesthetic evaluation criteria and follow-up periods, which limits more consistent comparisons among studies.

In this regard, controlled clinical studies with larger sample sizes and standardized methodologies are needed to confirm the efficacy, safety, and stability of the results obtained with Antivet® in different degrees of DF and clinical contexts. Further investigations evaluating the long-term aesthetic durability of the treatment, its possible effects on dental enamel

structure, and its impact on patients' quality of life are also recommended.

4. CONCLUSION

Antivet® demonstrated greater clinical efficacy when compared with other microabrasive methods, promoting lower levels of dentin hypersensitivity and gingival irritation.

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