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Petrovic, D¹; Galic, D²; Seifert, D³; Lesic, N⁴; Smolic, M⁵.**ADMINISTRATIVE INFORMATION**

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Review Stage at time of this submission - Completed but not published - A systematic review of previous work has already been carried out. Due to the extremely small number of studies and tests performed on this material in the area of dentin hypersensitivity, we did not perform a preliminary study, but obtained the results of a review of the published literature and the final results of this review paper.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202370006

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 02 July 2023 and was last updated on 02 July 2023.

INTRODUCTION

Review question / Objective The objective of this review is to evaluate current research on the use of at-home and in-office desensitizing agents containing BAG (CSPS and FCPS) compared to negative or positive control groups in adult participants. The null hypothesis is that BAG does not reduce the symptoms of DH compared to the control group.

Condition being studied Dentin hypersensitivity (DH) is a frequent condition with a prevalence of 10 to 30% in the general population, making it one of the main problems in dental practice. The impression of pain in oral disorders, including DH, is significant in comparison to the actual source of

the pain, but when compared to other sections of the body. According to sufferers, DH-related discomfort is so troublesome that it makes it difficult to eat, sleep, or even work. The agony, which manifests suddenly yet is sustained for a long time by a sizable proportion of patients. Gibson et al. propose that DH should be regarded as a chronic condition due to the persistence and repetition of pain over such protracted periods of time. The impact on social and family life, as well as on the ability to work and make a living, are all clear indicators of consequences. Thus, conducting meaningful assessments of chronic pain is a difficult undertaking, both in clinical practice and in research on chronic pain management [6]. Since 2004, Bioglass 45S5® particles have been used in toothpaste under the name NovaMin® [5]. The

FDA-approved fluoride-free daily toothpaste containing 5% Nova-Min® (Oravive®) was the company's first offering. It was developed to rapidly and continuously reduce the sensitivity of dentin. In order to synthesize newly obtained data in this research area, we include all relevant literature published within the last five years in this review. The objective of this review is to evaluate current research on the use of at-home and in-office desensitizing agents containing BAG (CSPS and FCPS) compared to negative or positive control groups in adult participants. The null hypothesis is that BAG does not reduce the symptoms of DH compared to the control group.

METHODS

Search strategy For this systematic review, three electronic databases (Scopus, PubMed, and Cochrane Library) were manually searched for published scientific articles on October 10, 2022, with a limit from 2018 to 2022 regarding the age of publication. The authors searched for terms: „bioactive glass“ or „phosphosilicate“ along with the term „dentin sensitivity“. There was no language limitations. The gray literature was not searched.

Participant or population Randomized clinical trials of any duration published between 2018 and 2022 involving adult participants older than 18 years diagnosed with DH from evaporative, mechanical, or thermal stimulation were included in this systematic review.

Intervention Included studies had an experimental group containing bioactive glass and a control group with a placebo or desensitizing agent that did not contain bioactive glass. Also, patient follow-up and quantified pain ratings were required for inclusion in this report. Studies that reported DH due to tooth restoration, crown preparation, bleaching, or periodontal surgery were excluded.

Comparator Control group with a placebo or desensitizing agent that did not contain bioactive glass.

Study designs to be included In order to synthesize newly obtained data in this research area, we include all relevant literature published within the last five years in this review. The initial search of all sources yielded 269 entries. Before screening, duplicated articles (146 entries) were removed. After screening titles and abstracts, articles unrelated to this systematic review (114 records) were eliminated. As a result, 9 articles were retained for the full-text review, whereas 2

articles were excluded (no control group, DH caused by periodontal treatment). The remaining 7 reports were included in this review.

Eligibility criteria We used only PICO criteria.

Information sources For this systematic review, three electronic databases (Scopus, PubMed, and Cochrane Library) were manually searched for published scientific articles on October 10, 2022, with a limit from 2018 to 2022 regarding the age of publication. The authors searched for terms: „bioactive glass“ or „phosphosilicate“ along with the term „dentin sensitivity“. There was no language limitations. The gray literature was not searched.

Main outcome(s) CSPS was not significantly different from certain positive control groups (15% nano-HAP, 10% nano-HAPKN (nano-HAP supplemented with potassium nitrate), Nd:YAG laser, fluorinol toothpaste), so they may be complementary in terms of alleviating DH pain [27,30,32]. Compared to 10% nano-HAP, CSPS reduced DH significantly more at 6 and 8 weeks [27]. However, fluorinol toothpaste performed better at 3 and 4 weeks to tactile stimulation. Namely, it reduces dentin permeability by precipitating calcium fluoride in the dentinal tubules [30].

Proargin™ and strontium acetate are efficacious in relieving DH pain in the short term, but FCPS may be the best long-term treatment option [28], as shown by Patel et al. [33] after 1 month when visual analogue scale (VAS) scores in the FCPS group were found to be significantly better when compared to the ProArgin® and placebo toothpastes in the treatment of DH.

According to Ashwini et al. [29], the FCPS group was more effective than the CSPS and standard fluoride dentifrices in reducing DH symptoms.

Quality assessment / Risk of bias analysis We used the RoB 2.0 tool [26] to assess the risk of bias in all of the included studies. Table 3 provides a summary of these assessments for each of the five individual domains of the Risk of bias assessment. There were some concerns about the overall risk of bias, with three of the articles rated as having a high risk of bias and two rated as having some concerns.

Strategy of data synthesis Since recent research has also used fluoro calcium phosphosilicate (FCPS) as an experimental group for DH treatment and bioactive glass and bioactive glass-ceramics do not have the same properties [24], we have decided to include in this review all relevant

literature on the subject of bioactive glass (CSPS and FCPS) and to exclude bioactive glass-ceramics as an experimental group. Full-text data were extracted from the selected eligible articles. After double-checking for accuracy, the extracted data were compared. We collected data on the report (author, publication year, title), participants (number, age), and intervention (sensitivity measures for eligibility criteria, home/office application, application instructions, pain assessment scales with type of stimulation, experimental and control groups, duration of follow-up, and outcomes). The initial search of all sources yielded 269 entries. Before screening, duplicated articles (146 entries) were removed. After screening titles and abstracts, articles unrelated to this systematic review (114 records) were eliminated. As a result, 9 articles were retained for the full-text review, whereas 2 articles were excluded (no control group, DH caused by periodontal treatment). The remaining 7 reports were included in this review.

Subgroup analysis A small number of studies were included in this qualitative synthesis (n=7), four of which used CSPS for the experimental group [27,30–32], two used FCPS as the experimental group [28,33], and one study compared the effects of these two products [29].

Sensitivity analysis This study has certain limitations such as a small number of included studies (n=7), a high risk of bias (n=3), and variability and heterogeneity in clinical research methodology. For future studies, we recommend the standardization of DH detection procedures, both for the comparison of data in future studies in this research area, and especially for the systematization of DH detection in general.

Language restriction There was no language limitations.

Country(ies) involved Croatia (Department of Dental Medicine, Faculty of Dental Medicine and Health, J.J. Strossmayer University of Osijek, 31 000 Osijek).

Keywords bioactive glass; calcium sodium phosphosilicate; dentin hypersensitivity; fluoro calcium phospho-silicate.

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