Effectiveness of desensitizing toothpastes for dentin hypersensitivity: a network meta-analysis

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Relevance to diversity: There is a great diversity of toothpastes to control dentin hypersensitivity (DH) in the market and its common for consumers to be faced with a multitude of options on store shelves. A systematic review with network meta-analysis can guide both consumers and clinicians in deciding, which are the most effective active ingredients for the management of pain.

Relevance to patients and consumers: While dentine hypersensitivity (DH) can be managed through home-use of desensitizing toothpastes, there is no gold standard toothpaste formulation. This leaves patients and dentists in a difficult position of having varying choices and prices at the drug store toothpaste isle to consider.
**Background:** Dentin hypersensitivity (DH) largely affects adults, with increasing prevalence between 30 to 40 years. Home use of desensitizing toothpastes can be an inexpensive self-management option for controlling the pain arising from DH.

**Objective:** To compare the effectiveness of toothpastes formulations to treat dentin hypersensitivity (DH).

**Methods:** A search was conducted across seven databases to February 2018. Pairs of independent reviewers screened studies, extracted data and performed risk of bias (RoB) through Cochrane Risk of bias tool 2.0. The primary outcome was pain, measured through air, tactile and cold stimuli. We performed a random Bayesian network meta-analysis to combine direct and indirect evidence for each outcome. We calculated standardized mean difference (SMD) and their credible intervals (Crl) for each outcome. Summary under the cumulative curve (SUCRA) values were calculated and we assessed the certainty of evidence through GRADE (Grading of Recommendations, Assessment, Development & Evaluation).

**Results:** A total of 125 randomized controlled trials (RCTs) were included (13,113 patients with mean age of 39.6 years). Most trials were from North America (36%), Asia (36%) or Europe (21%) and were published after 2010 (62.4%), including 21 types of interventions. For tactile stimulus, the best active ingredients according to SUCRA to reduce pain were: potassium+ stannous fluoride (SnF$_2$) (87.5%, low certainty), arginine (81.2%, low certainty), potassium+hydroxyapatite (73.5%, high to moderate certainty) and calcium sodium phosphosilicate (CSP) (68.2%; high to moderate certainty). For cold stimulus, the best treatments were CSP (93.3%; moderate to low certainty), strontium (60.4%), low certainty, hydroxyapatite (58.4%, low certainty) and arginine (55.7%, low to very low certainty). For air stimulus, the best treatments were arginine (78.3%, low to very low certainty), potassium+hydroxyapatite (78.2%, high to moderate certainty), potassium+SnF$_2$ (77.7%, low certainty), CSP (71.4%, moderate certainty).

**Conclusions:** Most interventions showed evidence of superiority against placebo or fluoride (amine fluoride, MFP or NaF) in reducing DH. With varying moderate to very low certainty of evidence, isolated active ingredients arginine and CSP seem to be the best interventions. Potassium combined either with SnF$_2$ or hydroxyapatite seems to be the best combination interventions with high to low certainty of evidence.
**Patient or healthcare consumer involvement:** This was the first systematic review that compared all types of toothpaste formulations, focusing on comparisons between different active ingredients. We ranked the best active ingredients to treat each type of pain, either tactile, cold or air stimulus. The choice of the best treatment should be a shared-decision between the clinician and the patient according to the patient’s values and preferences.

**Funding:** CCM received a post doc fellowship by CAPES (Coordination for the Improvement of Higher Educational Personnel, Ministry of Education, Brazil, process #88881.119166/2016-01), during their post doctoral studies at McMaster University. JJR is supported by a PhD training award from the NCMIC Foundation.

**Key words:** dentifrices; dentistry; randomized controlled trial; dentine sensitivity; conflict of interest; therapeutics.

**Conflict of interests:** None.