Table 2. Characteristics of included articles (*in vivo* studies)

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| **Author (Year)** | **Title** | **Study design** | **Study aim** | **Outcome Measurement** | **Sample Size (SS), Follow-Up (FU)** | **Material(s) or Technology(ies) Used** | **Active agent(s)** | **Primary results** |
| Chalas (2015) | Assessment of Pain Intensity in Patients with Dentin Hypersensitivity After Application of Prophylaxis Paste Based on Calcium Sodium  Phosphosilicate Formula | Longitudinal study | The clinical evaluation of the effectiveness in eliminating dentin hypersensitivity after a single application | The pain reaction of exposed dentine was induced by tactile and dehydrating stimuli, asking patients  to assess the severity of pain on the VAS scale | SS: 92 teeth with hypersensitivity  FU: baseline and after 1 week | NUPRO®  Sensodyne® Prophylaxis Paste, Dentsply (NovaMin Formula) | Calcium Sodium Phosphosilicate (CSPS) | In-office use of professional prophylactic paste with NovaMin formula noticeably reduces dentin  hypersensitivity 1 week after application |
| Zang (2016) | A Randomized Clinical Trial Investigating the Effect  of Particle Size of Calcium Sodium Phosphosilicate (CSPS) on the Efficacy of CSPS-containing Dentifrices for the Relief of Dentin Hypersensitivity | Randomized clinical trial | To compare the efficacy in dentin hypersensitivity relief | The hypersensitivity was measured by tactile stimulus (Yeaple probe) and evaporative (air) stimulus (Schiff Sensitivity Scale, visual analogue scale) | SS: 133 subjects  FU: baseline and after 1, 2, 4 and  8 weeks | Vitryxx® (NaF and < 5%  CSPS)  NovaMin® (NaF or SMFP and 5% CSPS)  Regular fluoride toothpaste | Sodium fluoride and Calcium Sodium Phosphosilicate (CSPS)  Sodium mono fluorophosphate (SMFP) and CSPS  Fluoride | The apparent absence of a positive treatment effect for the  CSPS-containing dentifrices compared to the regular fluoride dentifrice is inconsistent with other previously reported efficacy studies for CSPS dentifrices |
| Majji (2016) | Clinical efficacy of four interventions in the reduction of dentinal hypersensitivity: A 2‐month study | Randomized clinical trial | To compare the efficacy  in reduction of dentinal hypersensitivity | The patients’ dentin hypersensitivity scores for tactile, thermal, and evaporative stimuli were recorded on a visual analog scale | SS: 160 subjects  FU: baseline, after 2 weeks  and after 1 and 2 months | Toothpaste with 5% potassium nitrate  NovaMin toothpaste (calcium sodium phosphosilicate)  Toothpaste with | Potassium Nitrate  Calcium Sodium Phosphosilicate (CSPS)  Strontium chloride | The four desensitizing kinds of toothpaste containing different active agents were effective in relieving dentinal hypersensitivity. |

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|  |  |  |  |  |  | 10% strontium chloride  Toothpaste with herbal formulation | Hekla lava, calendula, kresote, and plantago | However, CSPS group showed a better clinical response at the end of 2 months |
| Sufi (2016) | Efficacy of an experimental toothpaste containing  5% calcium sodium phosphosilicate in the relief of  dentin hypersensitivity: An 8-week randomized study (Study 2) | Randomized clinical trial | To compare the efficacy in relieving dentin hypersensitivity | Dentin hypersensitivity was assessed by response to tactile and evaporative (air) stimuli, and using a Dentine Hypersensitivity Experience Questionnaire (a validated quality of life measure) | SS: 137 subjects  FU: baseline and after 4 and 8 weeks | Experimental toothpaste w/ 5% calcium sodium phosphosilicate  Placebo abrasivity matched 0% calcium sodium phosphosilicate with additional abrasive silica  Two control fluoride toothpastes | Calcium Sodium Phosphosilicate (CSPS)  Fluoride | The experimental 5% CSPS  toothpaste demonstrated statistically significant reductions from baseline in sensitivity at weeks 4 and  8 for each clinical measure (all P< 0.01) |
| Hall (2017) | Exploratory randomised controlled clinical study to evaluate the comparative efficacy of two occluding toothpastes – a 5% calcium  sodium phosphosilicate toothpaste and an 8% arginine/calcium carbonate toothpaste – for the longer-term relief of dentine hypersensitivity | Randomized clinical trial | To compare the efficacy  in relieving dentine hypersensitivity | Sensitivity was assessed by evaporative (air) and tactile stimuli measured by the Schiff Sensitivity Scale/visual analogue scale and  tactile threshold, respectively | SS: 135 subjects  FU: baseline and after 1, 2, 4, 6  and 11 weeks | Sensodyne Repair & Protect (5% calcium sodium phosphosilicate)  Colgate Sensitive Pro-Relief (8% arginine and calcium carbonate)  Colgate Triple Protection (1450 ppm fluoride) | Calcium Sodium Phosphosilicate (CSPS)  Arginine and Calcium Carbonate  Fluoride | A 5% CSPS  occluding toothpaste was effective in relieving DH compared with a regular fluoride toothpaste; an 8% arginine and calcium carbonate  anti-sensitivity toothpaste provided similar benefits.  Improvements in DH continued throughout the 11-week study |
| Gallob | A randomized | Randomized | To compare the | Dentin | SS: 249 subjects | US Sensodyne® | 5% potassium | A wide variety of |

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| (2017) | exploratory clinical evaluation of dentifrices used as controls  in dentinal hypersensitivity studies | clinical trial | efficacy in relieving  dentine hypersensitivity | hypersensitivity was  assessed using tactile and evaporative (air) (measured by Schiff Sensitivity Scale and a visual rating scale [VRS]) stimuli | FU: after 4 and 8 weeks | Freshmint Maximum Strength  US Crest® Pro-HealthTM Healthy Fresh  US Colgate® Cavity Protection  US Colgate® Triple Action  US Crest® Cavity Protection  Three toothpastes with non-marketed formulation | nitrate and fluoride in silica base  Stannous fluoride in silica base  Sodium mono fluorophosphate in dicalcium phosphate base  Sodium fluoride in silica base and different ppm fluoride concentrations  Sodium mono fluorophosphate in a silica base and different concentrations of abrasive silica | negative-control dentifrices are suitable and appropriate standards against which to assess dentifrices considered to be effective in reducing dentinal hypersensitivity |
| Fu (2019) | An Exploratory Randomised Study to Evaluate the  Efficacy of an Experimental Occlusion-based Dentifrice in the Relief of Dentin Hypersensitivity | Randomized clinical trial | To compare the efficacy  in relieving dentine hypersensitivity | The hypersensitivity was assessed by evaporative (air) (Schiff sensitivity score and visual analogue scale [VAS]) and tactile (tactile threshold) stimuli | SS: 147 subjects  FU: baseline and after 1, 2, 4 and  8 weeks | 2.5% calcium sodium phosphosilicate toothpaste  8% arginine toothpaste  Negative control toothpaste | Calcium Sodium Phosphosilicate (CSPS)  Arginine Fluoride | No statistically significant differences were found between a small particle size 2.5% w/w CSPS dentifrice and an 8% w/w arginine dentifrice in terms of a dentine hypersensitivity decrease |
| Patel (2019) | A randomized clinical trial on the efficacy of 5% fluorocalcium phosphosilicate‐contain ing novel bioactive | Randomized clinical trial | To compare the efficacy  in relieving dentine hypersensitivity | The hypersensitivity was evaluated by tactile and evaporative | SS: 75 subjects  FU: baseline, 15  days and 1 month | BioMin-F (5% fluorocalcium phosphosilicate)  Pro-Argin (8% | Fluorocalcium Phosphosilicate  Arginine and calcium | The results showed symptoms of dentin hypersensitivity |

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|  | glass toothpaste |  |  | stimuli, and a visual analogue scale (VAS) was used for evaporative stimuli |  | arginine and calcium carbonate)  Placebo | carbonate Fluoride | were reduced in all three  groups. However, the toothpaste containing 5% fluorocalcium phosphosilicate was reported  to be more efficacious than the other two toothpastes |
| Bhowmik (2020) | Comparative evaluation of fluorinol and calcium sodium  phosphosilicate-containi ng toothpastes in the treatment of  dentin hypersensitivity | Randomized clinical trial | To compare and assess the efficacy of fluorinol-containi ng toothpaste with 7.5% sodium calcium phosphosilicate-c ontaining toothpaste in reducing dentin hypersensitivity. | Sensitivity was assessed  by means of tactile, evaporative and cold water stimuli (visual analogue scale (VAS)).  Gingival index (Silness & Loe, 1964) and Plaque index (Loe &  Silness, 1963)  Oral health-related  quality of life was assessed using OHIP-14  questionnaire. | SS: 30 subjects  FU: Baseline, 2nd week 3rd week,  4th week | Fluorinol-containi ng Elgydium Sensitive Toothpaste.  7.5% calcium sodium phosphosilicate- containing  Shy-NM Toothpaste. | Fluorinol  Sodium calcium phosphosilicate | Both the groups showed significant reduction in dentin hypersen- sitivity from baseline to the 4 weeks of  follow-up. Plaque index and Gingival index showed reduction in both the groups, but there was  no statistical significance between the groups. The oral health-related quality of life assessed using the OHIP-  14 questionnaire also showed no statistically significant difference between the groups |

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| Vilhena (2020) | Effectiveness of Toothpaste Containing REFIX Technology against Dentin Hypersensitivity: A Randomized Clinical Study | Open clinical treatment trial | Was to evaluate clinically the efficacy of a toothpaste containing this new proprietary technology  for reducing dentin hypersensitivity.  The research hypothesis was that the use of this toothpaste would reduce the pain reported by patients with dentin hypersensitivity. | evaporative stimuli (visual analogue scale (VAS)). | SS: 62 subjects  FU: baseline, immediately after treatment,  1-week treatment. | dentifrice containing REFIX technology (Regenerador + Sensitive DentalClean, Rabbit Corp, Londrina, PR, Brazil). | Fluoride  Tetrasodium pyrophosphate  Silica | A significant reduction in pain level was observed immediately after the first brushing with the product (p < 0.05). The mean pain  level reduced by 62.5% after the first use (from 6.5 to 2.5).  After 7 days of consistent use, the  patient-reported pain level also significantly reduced to 0.7  (p< 0.05),  representing a mean decrease of 88.3% as compared to the baseline. |
| Seong (2020) | A randomised controlled trial investigating efficacy of a novel toothpaste containing calcium silicate and sodium phosphate in dentine hypersensitivity pain reduction compared to a fluoride control toothpaste | Double-blind parallel study | To compare a calcium silicate and sodium phosphate toothpaste (CSSP) with a fluoride negative control toothpaste for dentine hypersensitivity (DH) pain reduction after 14, 28 and 29 days. | Sensitivity was assessed following airblast (Schiff and VAS) and tactile (Yeaple probe)  Quality of life questionnaire (OHQoL) | SS: 247 subjects  FU: Baseline, 14 and 28 days, and at 29 days, 12 h after last product application. | calcium silicate and sodium phosphate toothpaste (CSSP)  1450 ppm fluoride as sodium monofluorophosp hate (negative control toothpaste) | Calcium silicate and sodium phosphate (CSSP)  Fluoride | After 14, 28 and  29 days the CSSP group had significantly lower Schiff, lower VAS and higher Yeaple probe scores compared to control (VAS at 14 days, p < 0.04; all other comparisons, p < 0.001). Quality of life  scores improved in both groups, |

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| Arshad (2021) | Comparative efficacy of BioMin-F, Colgate Sensitive Pro-relief and Sensodyne Rapid Action in relieving dentin hypersensitivity: a randomized controlled trial | Randomized clinical trial | This study investigated the relief from pain in DH in one minute after applying over the counter (OTC) dentifrices with Pro-ArginTM and strontium acetate and directly compared them with  fuoro-calcium phospho-silicate (FCPS)-based dentifrices for immediate and sustained inhibition of painful stimulus provoking DH. | air blast, mechanical, and water  jet stimuli on SCHIFF cold air sensitivity scale (SCASS) and visual analogue scale (VAS) | SS: 128  participants  FU: one minute, three days, two, four, and six weeks | BioMin F®  Colgate® Sensitive Pro-ReliefTM  Sensodyne Rapid ActionTM  Colgate® Total (Placebo) | Fluoro-calcium-p hospho-silicates (FCPS)  Pro-ArginTM with 8.0% arginine  and 1450 ppm fuorides as sodium mono- fuoro-phosphate in calcium carbonate base  8% strontium  acetate, 1040 ppm fuorides as sodium fuoride  Sodium fuoride, sodium  mono-fuoro- phosphate, dicalcium phosphate with 1150 ppm fuorides | All the treatment groups showed statistically signifcant improvement in DH with p<0.001 relative to baseline at all time points.  Pro-ArginTM showed a greater reduction in DH with mean scores of (1.34±0.68)  (4.20±1.70)  (3.05±2.17)  followed by strontium acetate (1.57±0.81)  (4.65±1.87)  (3.75±1.97) on SCASS and VAS  for mechanical and water jet stimuli, one minute after application. There was no sta-  tistically signifcant treatment diference between the two (p=0.499). FCPS  showed the highest reduction in DH on |

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|  |  |  |  |  |  |  |  | SCASS and VAS  for waterjet stimuli with mean scores of (0.97±0.68)  (1.80±1.73) and  Pro-ArginTM on VAS for mechani- cal stimuli with mean scores of (2.15±1.92) in six weeks. |
| Hamdi (2022) | Long-term evaluation of early-enamel lesions treated with  novel experimental tricalcium silicate paste:  A 2-year randomized clinical trial | Randomized clinical trial | The aim of the current study is to evaluate the remineralization potential of experimental tricalcium silicate (TCS) paste in comparison with more popular remineralizing agents like silver diamine fluoride potassium iodide (SDF-KI) and  casein phosphopeptide amorphous calcium phosphate (CPP-ACP) on  early enamel lesions. | Lesions were evaluated clinically by DIAGNOdent | SS: 45 patients  and 92 teeth  FU: immediately and after 3,6,12, and 24 months of treatment. | Riva star silver fluoride + potassium iodide  Tooth Mousse Casein phosphopeptide  –Amorphous calcium phosphate (CPP-ACP)  Tri-calcium silicate paste | SDF-KI CPP-ACP TCS | The study was completed with 45 patients and  92 teeth.  Twice-daily appli- cation of  CPP-ACP and TCS paste showed a significant remineralization effect on early enamel lesions after 24 months (p < 0.001). Also,  annual application of SDF-KI  showed a significant remineralization effect after 24 months (p < 0.001). There was a significant difference  between (SDF-KI and CPP-ACP)  and (SDF-KI and TCS) at the |

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|  |  |  |  |  |  |  |  | different follow-up periods  3,6,12, and 24  months (p < 0.001).  Meanwhile, there was  no significant difference between  CPP-ACP and TCS at the mentioned follow-up periods (p > 0.05). |
| Salah (2022) | Efficacy of novel bioactive glass in the treatment of enamel white spot lesions: a randomized controlled trial | Randomized controlled trial | To evaluate the efficacy of 2 types of bioactive glass (45S5) compared to casein- phosphopeptide stabilized-amorp hous calcium phosphate  (CPP-ACP) in  the treatment of orthodontically-in duced white spot lesions (WSLs). | Change in WSL dimensions using computer assisted analysis based on standardized digital intraoral photographs  in addition to laser fluorescence DIAGNOdent | SS: 60 subjects  FU: assessment before treatment (T0) and at 1 week (T1), 1  month (T2), 3 months (T3,) and 6 months (T4) follow up | BiominF Bioactive glass 45S5  Novamin Bioactive glass 45S5  Recaldent Casein  phospho-peptide amorphous calcium phosphate  (CPP-ACP) | Bioactive glass 45S5  CPP-ACP | Kruskal Wallis test was used (P  < .05 for all). At T4, a statistically significant  (P < .001)  regression of WSL was disclosed in all 3 groups compared to baseline,  and a highly significant lesion size percent reduction in  Bio-BAG group compared  to the control group (P < .001). The mean area of the lesions decreased by 64.8%, 32.2%,  and 31.6% for groups I, II and III respectively (P =  .001). |

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|  |  |  |  |  |  |  |  | DIAGNOdent find-  ings largely reflected the clinical scores (Mean scores at baseline/T4 for groups I, II, and III respectively; 16.57/3.62,  16.93/7.90,  21.95/19.27). No  adverse effects were reported. |
| Mollabashi (2022) | DIAGNOdent pen quantification of the synergy of NovaMin® in fluoride toothpaste  to remineralize white spot lesions in patients with fixed  orthodontic appliances: A double-blind, randomized, controlled clinical trial | Randomized clinical trial | White spot lesions (WSLs) are a real problem in patients with fixed orthodontic appliances with inadequate hygiene and eating habits.  This study aimed at evaluating the synergic  effects of NovaMin in fluoride toothpaste on remineralization of WSLs in patients with fixed orthodontic appliances. | DIAGNOdent pen (KAVO Dental Corporation, Germany) was used to score the WSLs | SS: 38 subjects  FU: baseline and then after the usage for  1 and 3 months. | Fluoride toothpaste (Sensodyne® Rapid Relief, England)  NovaMin (Sensodyne® Repair and Protect, England). | Fluoride Hydrated Silica  Sodium mono fluorophosphate (SMFP) | In both groups (P  < 0.001), the  DIAGNOdent reading of the WSLs decreased significantly after 1 and at 3 months, though no significant difference was found between the two  groups at different intervals. Each patient had no adverse effects. |