Effectiveness of nano-Hydroxyapatite in Reducing Bleaching Related Tooth Sensitivity: A Systematic Review & Meta Analysis

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BACKGROUND AND AIM

Vital tooth bleaching is a popular, conservative treatment option that is easily accepted by patient for improved smile esthetics. The whitening peroxides diffuse into the tooth and reach the Transient Receptor Potential Ankyrin-1 (TRPA-1) chemo-sensitive ion channels activating the nerve endings in dentin causing hypersensitivity.

This systematic review aims to evaluate the effect of n-HAP in reduction of bleaching related hypersensitivity.

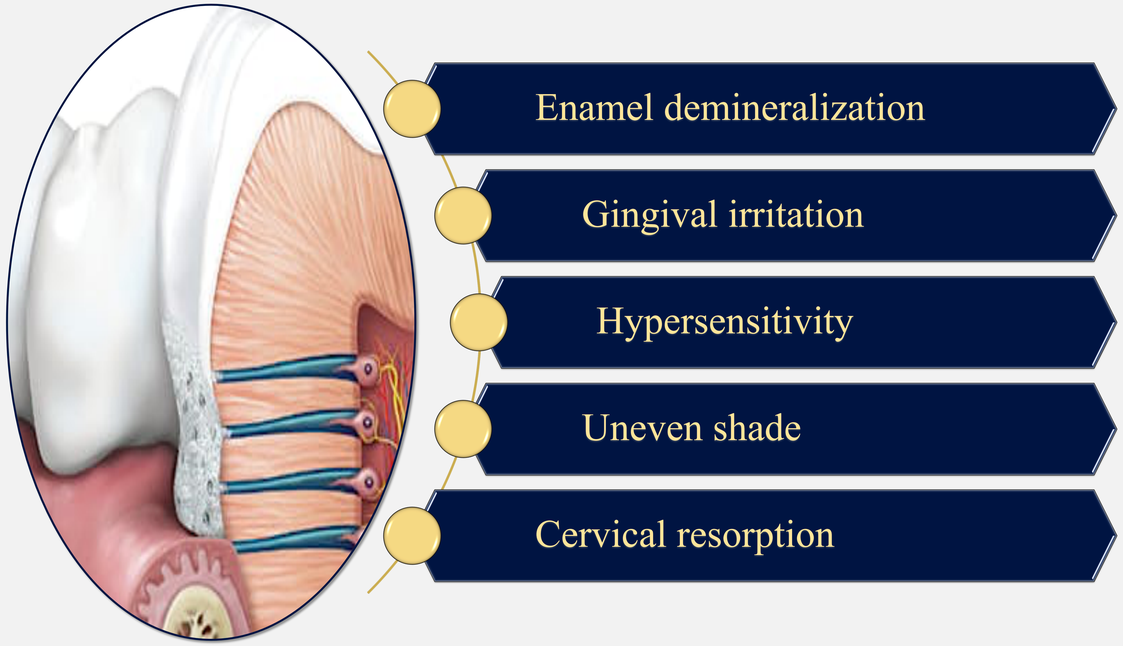


Figure 1: Adverse Effects of Vital Bleaching

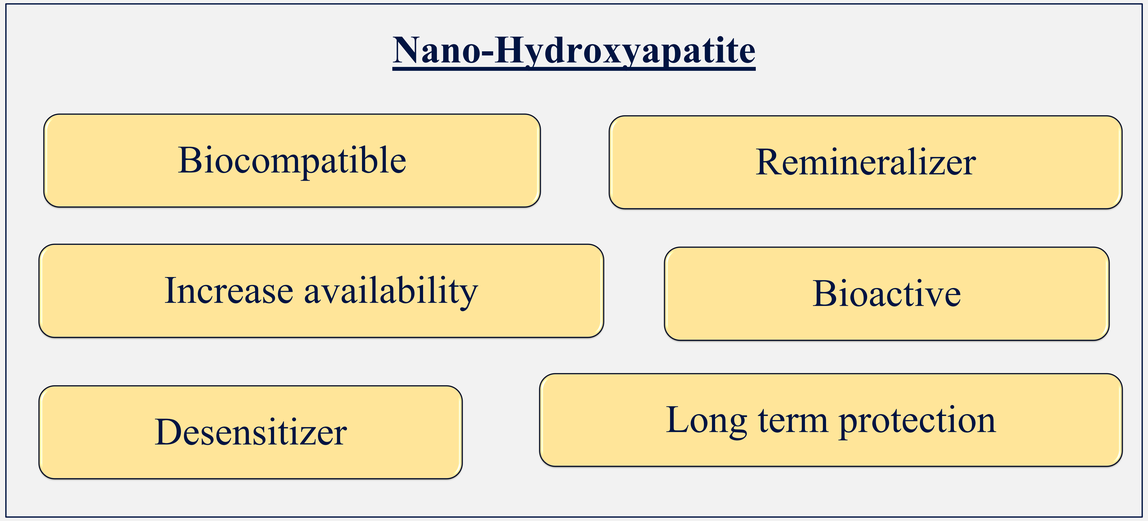


Figure 2: Favorable properties of nano-Hydroxyapatite

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METHODOLOGY

After eliminating duplicates, studies were further scrutinized and excluded on the basis of language, title, abstract, irrelevant object, study design, in-vitro/animal study. Articles with full-text available in English were included as per the pre-set PICOS-model and summarized in PRISMA flow-chart.

Registration:PROSPERO(CRD42020196800)

- **P** — Patients that had undergone dental bleaching
- **I** — Nanohydroxyapatite (n-HAP)
- **C** — Placebo
- **O** — Reduction hypersensitivity; Change in color
- **S** — Randomized Controlled Trials

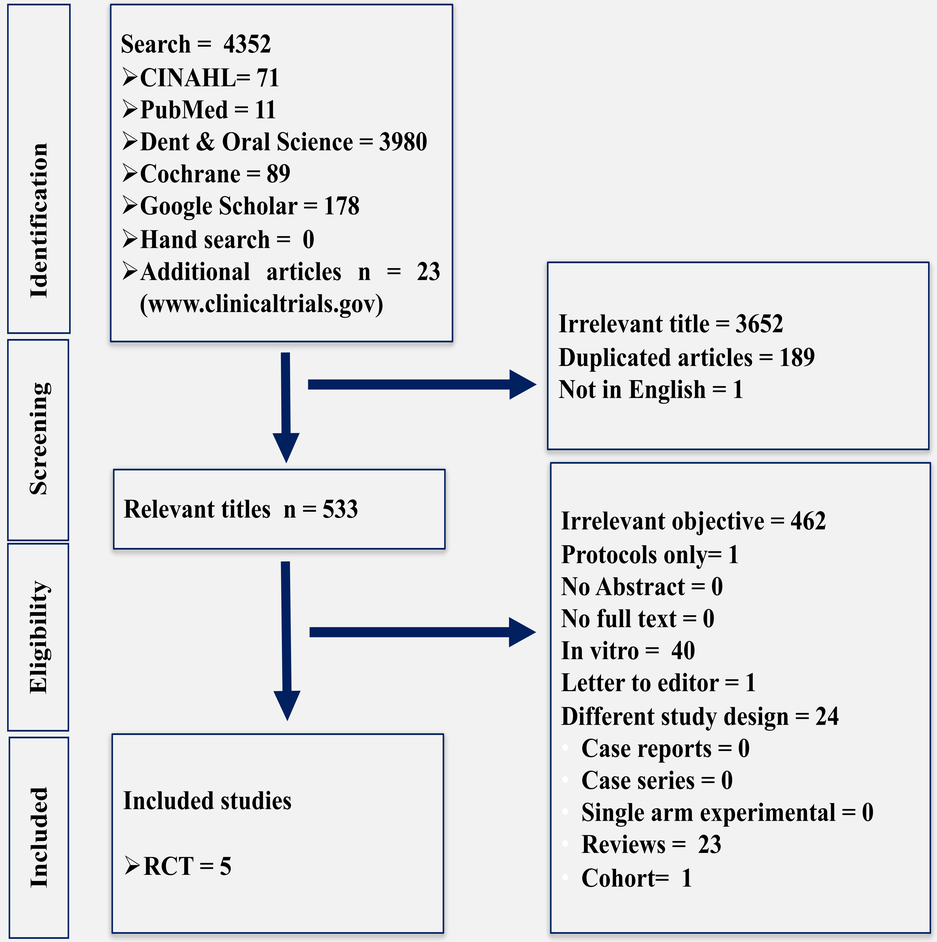


Figure 3: Literature Search PRISMA Flowchart

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RESULTS

Out of total 4352 articles, five randomized control trials were selected for review. One trial reported significant difference in terms of reduction in bleaching related hypersensitivity between the two groups and favored n-HAP, where as other reported significant number of days without sensitivity. One out of four trials report significant difference in color change among the groups in study. Meta-analysis forest plot showed insignificant difference in reduction of bleaching related sensitivity with n-HAP.

S No.	Author	groups	Measuring tool (primary)	Post Bleaching sensitivity *p-value*	No. of Days	Measuring tool (secondary)	Change in color *p-value*
1.	Browning et al. 2012	n-HAP Placebo	VAS	>0.05	<0.001*	Vita Bleachguide 3D	>0.05
2.	Vano et al. 2015	n-HAP Placebo	Tactile Schiff Cold Air VAS	>0.05	-	Vita	<0.05*
3.	Loguercio et al. 2105	n-HAP Placebo	VAS	>0.05	-	Vita	>0.05
4.	Palomino et al. 2015	n-HAP Placebo	VAS	>0.05	-	-	-
5.	Da Silva et al. 2018	n-HAP Placebo	Air jet, VAS	<0.05*	-	CIE Lab	>0.05

Figure 4: Included Studies with Primary and Secondary Outcomes

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DISCUSSION

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year
Browning 2012	0.23	0.22	21	1.65	1.38	21	31.3%	-1.42 [-2.02, -0.82]	2012
Vano 2014	2.61	1.04	30	3.06	1.25	30	31.5%	-0.45 [-1.03, 0.13]	2014
Palomino 2015	0.03	0.03	10	0.04	0.05	10	37.2%	-0.01 [-0.05, 0.03]	2015
Total (95% CI)			61			61	100.0%	**-0.59 [-1.42, 0.25]**	

Heterogeneity: Tau² = 0.49; Chi² = 23.44, df = 2 (P < 0.00001); I² = 91%

Test for overall effect: Z = 1.38 (P = 0.17)

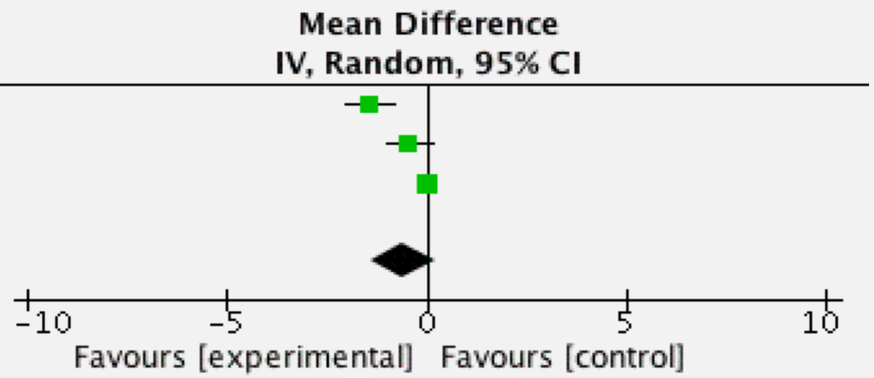


Figure 5: Forest plot presenting reduction in bleaching related dentin hypersensitivity

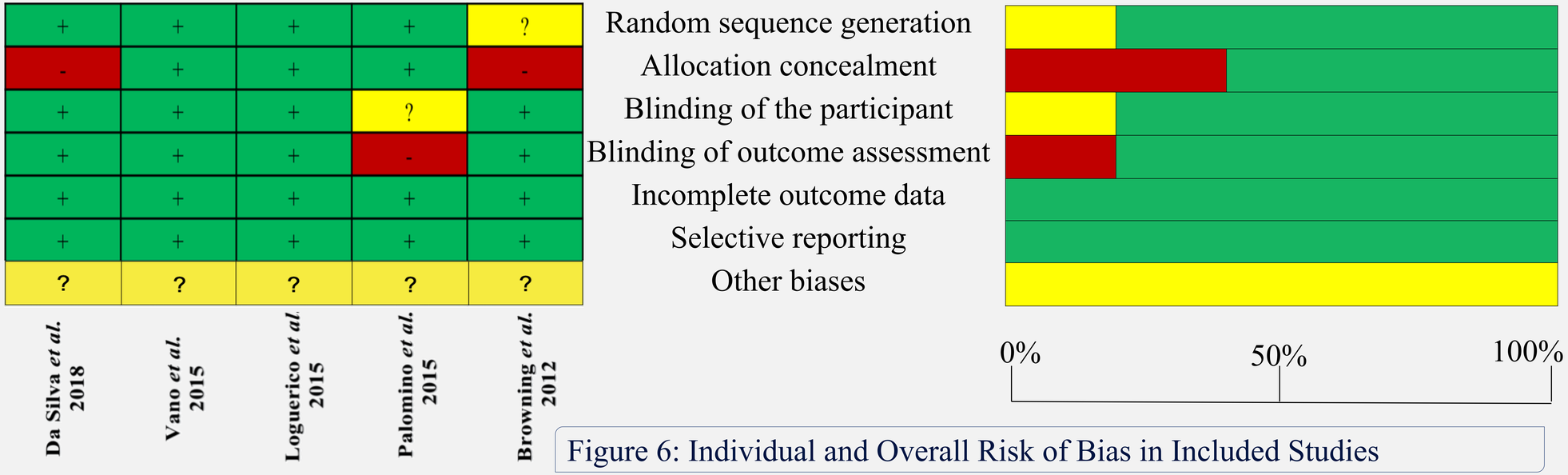


Figure 6: Individual and Overall Risk of Bias in Included Studies

CONCLUSION

This study concludes, Nano-hydroxyapatite was equally effective in reducing bleaching related hypersensitivity as compared to a placebo. Meta-analysis is inconclusive to suggest a significant difference but slightly favors the n-HAP group. Results of this study should be applied with caution due to limited studies.