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## RESEARCH ARTICLE

### INFLUENCE OF COFFEE ON COLOR STABILITY OF DIRECT / INDIRECT VENEERS: A SYSTEMATIC REVIEW

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#### ABSTRACT

**Objectives:** Over time, there has been a development in veneer materials, changes in preparations, and improvements in veneer cementation. Multiple research have assessed the impact of coffee on various physical characteristics of both direct and indirect veneers, as well as the materials utilized in their fabrication. The attribute of veneers that has received the most extensive research is their color stability. This systematic review aimed to study the effect of coffee as a beverage on color stability of direct and indirect veneers. **Material and Methods:** The current investigation was done according to the PRISMA 2020 Guidelines. The procedure for the systematic review was recorded in PROSPERO (CRD42024519382). A systematic qualitative search was conducted in two databases (PubMed, Scholar) until January 18, 2024. Two independent reviewers executed the search strategy, screened and selected studies, extracted methodology and result data, and assessed the internal methodological risk of bias. Strict inclusion and exclusion criteria were followed. The titles of the studies and their respective abstracts were reviewed independently by two authors in accordance with the inclusion criteria in order to choose the studies. The authors of the current review reached a consensus on the final inclusion of research after fully evaluating and screening the texts. "Modified CONSORT checklist of items for reporting in vitro studies of dental materials" assessed the bias. The study's final evaluation involved assigning a risk of bias of "low," "medium," or "high" to each researched aspect. The fulfillment or non-fulfillment of each of the 14 characteristics considered in the quality assessment was evaluated individually, and the percentage of compliant items was calculated using the formula (number of compliant items/total number of items x 100). **Results:** From the identified 1014 studies, 23 in-vitro studies were included for systematic review after removal of duplicates and strictly following the inclusion criteria. Among the studies reviewed, 37 different veneer materials were examined. The studies that were retrieved used various artificial staining techniques. Coffee is investigated in this review as a staining solution. The CIEDE2000 color difference formula and CIELAB formula was used for color assessment in the included studies. Four studies had low risk of bias (RoB) while remaining studies had medium risk of bias. Analysis revealed better color stability of indirect veneers when compared with direct veneers. **Conclusions:** This current study reviewed the effect of coffee on the various materials used for veneers. Based on current evidence, coffee definitely has a major impact on color stability of veneers. Resin materials that are machined instead of direct or prefabricated exhibit greater color stability. Indirect or direct materials do not exhibit the same color stability as resin-based blocks used in CAD/CAM processes.

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## INTRODUCTION

Demand for tooth-colored restorations and aesthetic smiles has grown worldwide, making veneers a popular, conservative option for correcting discoloration and dental imperfections<sup>1</sup>. Veneers can be made from porcelain, ceramics, or composite materials, and maintaining their color stability is as important as their

mechanical properties. Coffee, a widely consumed acidic beverage with high caffeine content, can negatively affect veneer surfaces and contribute to extrinsic staining, along with other factors such as tea, red wine, nicotine, and mouth rinses. Intrinsic factors affecting color stability include resin matrix composition, filler content and size, photoinitiators, and polymerization in composites, while in ceramics, composition

and surface glazing play a critical role in stain resistance and light reflection<sup>2</sup>. Color changes are commonly quantified using the CIELAB system, with  $\Delta E$  values indicating perceptibility: 0 is perfectly stable, 0–2 is minimal, 3–5 is clinically acceptable but perceptible, and values above 5 are considered unacceptable<sup>3,4</sup>. Numerous studies have examined coffee's effect on the color stability of direct and indirect veneers, yet results remain inconsistent. This systematic review aims to qualitatively summarize in vitro evidence on coffee-induced discoloration across veneer materials, with the null hypothesis that all materials exhibit similar color changes.

## MATERIALS AND METHODS

The current investigation followed the PRISMA 2020 guidelines<sup>5</sup>. Previously, the procedure for the systematic review was recorded in PROSPERO (CRD42024519382).

### Research Question

The qualitative research was conducted to address the following research question.

“How does coffee affect the colour stability of direct/indirect veneers?”

Population (P) - Patients with direct or indirect veneers  
Intervention/ Exposure (I) - Influence of coffee on veneers  
Comparator (C) - Influence on veneers without coffee  
Outcome (O) - Colour stability of direct/indirect veneers  
Study design (S) - In-vitro studies

### Inclusion Criteria

- Research conducted in in-vitro studies, randomised controlled trials evaluating coffee-related stains
- Works written in English

### Exclusion Criteria

- Research analysing stains caused by substances other than coffee
- Publications that are not in English
- Animal studies, case reports, and case series

**Information Sources:** One reviewer (SSC) searched the following internet databases for English-language dentistry journal publications published up until January 18, 2024: PubMed, Google Scholar. There was also a manual search done.

**Search Strategy:** The searches utilized a combination of MeSH terms and free-text keywords, including "coffee," "surface staining," "resin nano-ceramic," "resin ceramic," "hybrid composite," "veneers," "laminates," "direct veneers," "indirect veneers," "hybrid ceramic," "composite ceramic," "resin infiltrated," "composite," "nano-hybrid," "CAD/CAM," "CAD/CAM," "color stability," "staining," "staining susceptibility," "color change," and "color difference." The search strategy designed for PubMed was adapted for each database to align with differences in controlled vocabulary and syntax requirements.

Both SSC and SS independently executed the search strategy, screened and selected studies, extracted methodology and result data, and assessed the internal methodological risk of bias. A third researcher (SG) was included in the discussion process for any uncertainties.

**Selection process:** The titles of the studies and their respective abstracts were reviewed independently by two authors (S.S.C and S.S.) in accordance with the inclusion criteria in order to choose the studies. The authors of the current review reached a consensus on the final inclusion of research after fully evaluating and screening the texts.

**Data Items:** The data collected via an extraction form encompassed the type of veneers, comparisons with other materials, coffee staining procedures, staining protocols, timing for color assessments, types of spectrophotometers utilized, formulas for color difference, finished specimens, repolished specimens, clinical thresholds, and the results obtained.

**Study of Risk of Bias Assessment:** The internal methodological quality assessment (risk of bias) of the included in vitro studies was conducted using the "Modified CONSORT checklist of items for reporting in vitro studies of dental materials"<sup>6</sup>. This assessment took place after the selection process. The study's final evaluation involved assigning a risk of bias of "low," "medium," or "high" to each researched aspect. After doing the assessment independently, S.S.C. and S.S. engaged in discussion to settle any lingering questions or differences. The fulfillment or non-fulfillment of each of the 14 characteristics considered in the quality assessment was evaluated individually, and the percentage of compliant items was calculated using the formula (number of compliant items/total number of items x 100).

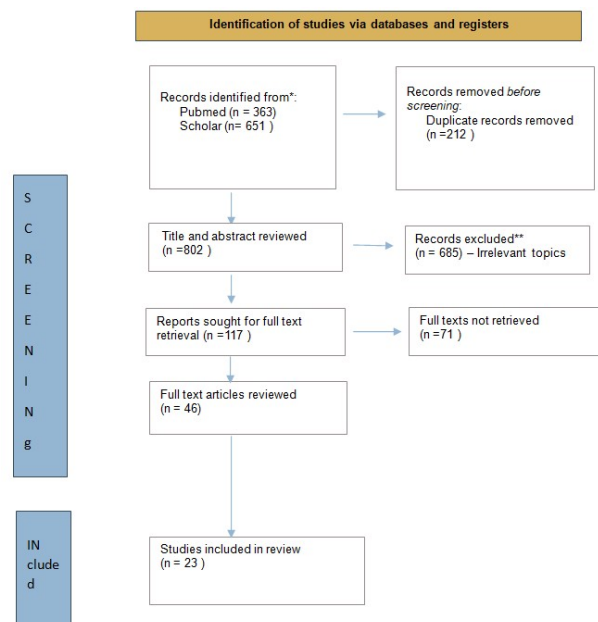


Figure 1. PRISMA 2020 flowchart

## RESULTS

### Study Selection and Study Characteristics

The study selection process, following the PRISMA checklist, is illustrated in Figure 1.

One thousand fourteen records were found overall from the individual database searches: (Google Scholar, 651; PubMed, 363). Duplicate entries were manually eliminated (n=212) using the reference manager software's "check for duplicates" feature. All titles and abstracts were assessed in an independent process by two reviewers (S.S.C and S.S). Once the inclusion criteria were evaluated, full texts of selected articles were obtained for in-depth evaluation. A full-text examination revealed that 23 of the resultant papers were included in a qualitative synthesis.

**Specimen Characteristics:** Among the studies reviewed, 37 different veneer materials were examined. The composition of these materials is detailed in Table 1.

**Characteristics of included studies:** Table 1 presents the characteristics of all studies that fulfilled the inclusion criteria.

**Staining Procedures:** The studies that were retrieved used various artificial staining techniques. Coffee is investigated in this review as a staining solution. Various times, ranging from one day to twelve weeks, were spent submerging the specimens in the staining media. Liquids were replenished at varying times in most studies. For the duration of the staining times, the static immersion was conducted for a few minutes each day. For the purpose of making coffee solutions, the majority of research (n = 14) employed boiled water. The liquids (n = 4) were thermocycled for additional research. The storage temperature was not specified in the remaining five experiments.

**Color Assessment:** The CIEDE 2000 color difference formula was used in three studies, while the CIELAB formula appeared in 18 studies. Additionally, only two studies applied both formulas.

**Qualitative Assessment of the Investigations:** The in vitro studies included in this review were evaluated using the "Modified CONSORT Checklist of Items for Reporting in Vitro Studies of Dental Materials" (Faggion 2012). Four studies showed low risk of bias whereas others showed medium risk of bias (Figure 2).

## DISCUSSION

Asymmetric color stability and stain sensitivity are two of the main issues with aesthetic restorations. Coffee has the potential to discolour prosthesis and restorations, which is something that needs to be noted. The effect of coffee on the color stability of both direct and indirect veneers is not well understood, even though coffee is commonly consumed. Assessing the color stability of different materials used in veneer manufacture was the goal of this review.

**Effect of coffee on color stability of direct veneers:** Direct composites were investigated as veneer materials in 10 out of 23 studies, with several reports indicating greater discoloration compared with indirect or CAD/CAM materials. Ren et al.<sup>7</sup> found that Filtek Supreme showed significantly higher color change than TPH3 and Renamel, and its residual  $\Delta E$  exceeded the clinical acceptability threshold after thermocycling, with incomplete recovery after brushing. Increased yellowness was attributed to pigment absorption within the resin matrix. Silorane-based composites demonstrated lower  $\Delta E$  values than methacrylate-based systems<sup>8,9</sup>, likely due to reduced water sorption and the hydrophobic nature of siloxane chemistry<sup>10-15</sup>. In contrast, methacrylate composites containing hydrophilic

monomers such as TEGDMA or HEMA, and those with lower filler loading, exhibited greater staining susceptibility<sup>16-18</sup>. Nanohybrid composites, including Filtek Supreme Ultra, showed more discoloration than ceramic and CAD/CAM materials, partly related to resin composition and hydrolytic degradation at the filler–matrix interface<sup>19-24</sup>.



Figure 2. Risk of bias summary

**Effect of coffee on color stability of indirect veneers:** Nikzad et al.<sup>38</sup> found that among two indirect composites and feldspathic porcelain, Gradia (indirect composite) showed the greatest discoloration after coffee immersion, with staining largely limited to the surface. Amar et al.<sup>15</sup> reported that laboratory-fabricated veneers (Nexco) were more color stable than prefabricated systems, likely due to differences in resin composition and curing protocols<sup>39</sup>. Alharbi et al.<sup>40</sup> demonstrated significantly greater staining in a 3D-printed nano-composite compared with a milled composite (Cerasmart), attributing this to interfacial defects, porosities, and residual monomers inherent to layer-by-layer fabrication<sup>41</sup>. In contrast, industrial polymerization and UDMA-based matrices in milled materials contribute to reduced water sorption and improved color stability<sup>42,43</sup>. Similarly, pre-formed veneers showed better color stability than direct veneers due to optimized laboratory polymerization and surface vitrification<sup>44</sup>. Consistent findings by Daghrery et al.<sup>45</sup> confirmed greater discoloration in 3D-printed veneers compared with prefabricated composites, emphasizing

Table 1. Characteristics of included studies

Author & Year	Journal	Veneer material	Type of veneers	Coffee used for staining	Preparation of staining solution	Threshold values	Time	Outcomes
Acar et al 2016 <sup>19</sup>	Journal of Prosthetic Dentistry	<ul style="list-style-type: none"> <li>hybrid dental ceramic (VITA Enamic)</li> <li>resin nanoceramic (Lava Ultimate)</li> <li>LiDiSi Glass Ceramic (IPS e. max CAD)</li> <li>Nanocomposite (Filtek Supreme Ultra Universal)</li> </ul>	CAD-CAM Direct	Coffee TC (5000 cycles, 5-55C)	1 rounded tbs + 177 ml water	E00 = 1.28 (p) E00 = 2.24 (a)		RNC = NCR > Hybrid Dental Ceramic > LiDiSi
Adawi et al 2021 <sup>55</sup>	Medical Science Monitor	<ul style="list-style-type: none"> <li>Zirconia reinforced lithium disilicate glass ceramic</li> <li>Hybrid glass ceramic blocks</li> <li>Feldspathic ceramic blocks</li> <li>Zirconia reinforced lithium disilicate glass ceramic</li> <li>Hybrid glass ceramic blocks</li> <li>Feldspathic ceramic blocks</li> </ul>	CAD- CAM	Hot coffee Arabic Qahwa	30g coffee + 0.5L boiling water at 100C		2, 4, 12 weeks	2, 4 weeks : HGC > FC > LiDiSi 12 weeks : FC > HGC > LiDiSi
				cold Frappuccino Coffee Drink	40mg coffee +100 ml water			2wks: HGC > FC > LiDiSi 4wks: HGC > LiDiSi > FC 12wks: LiDiSi > HGC > FC
Arif et al 2019 <sup>43</sup>	Journal of Prosthetic Dentistry	<ul style="list-style-type: none"> <li>Zirconia-reinforced lithium silicate ceramic (Celtra Duo)</li> <li>Lithium disilicate glass-ceramic (IPS e.max CAD)</li> <li>Polymerized resin nanoceramic (Lava Ultimate)</li> <li>Integrated ceramic and acrylate polymer network (VITA ENAMIC)</li> <li>Zirconia-reinforced Lithium silicate ceramic (VITA SUPRINITY)</li> </ul>	Indirect	Black Silk; Folgers Coffee Co Coffee TC 6000 cycles	1ml coffee + 15ml water	E00 = 1.30(p) E00 = 2.25(a)		RNC > Integrated ceramic & acrylate > Celtra Duo > Vital Suprinity > IPS E max CAD
Basheer et al. 2016 <sup>22</sup>	Egyptian Dental Journal	<ul style="list-style-type: none"> <li>Hybrid ceramic (Vita Enamic)</li> <li>lithium disilicate glass ceramic (IPS e.max)</li> <li>nanohybrid composite (IPS Empress Direct)</li> </ul>	CAD- CAM		5 gm coffee + 200 mL boiling distilled water		30 days	Direct NH Composite > Vita Enamic > IPS e max
			Direct					
Choi et al 2019 <sup>28</sup>	Dental Materials Journal	<ul style="list-style-type: none"> <li>resin composite</li> <li>compomer</li> <li>giomer</li> </ul>	Direct	coffee (Cantata Americano, Lottechilsung)	Coffee solid content 0.672%		1, 5 days	Giomer > Compomer > Resin composite
Colombo et al 2017 <sup>47</sup>	Journal of clinical dentistry	<ul style="list-style-type: none"> <li>Copran® Zr</li> <li>Katana™ Zirconia ML</li> <li>Metoxit Z-CAD</li> <li>breCAM.HIPC</li> </ul>	CAD/CAM Zirconia ceramics	coca cola + coffee			7, 14, 21, 28 days	D1 = Katana > MZ-CAD > HIPC > Copran D2 = Katana > MZ-CAD > Copran > HIPC D3 = MZ-CAD > Katana > HIPC > Copran D4 = HIPC > MZ-CAD > Katana > Copran
				physiologic sol + coffee				D1 = Katana > MZ-CAD > HIPC > Copran D2 = MZ-CAD > Katana > Copran > HIPC D3 = MZ-CAD > Katana > HIPC > Copran D4 = MZ-CAD > HIPC > Katana > Copran

Continue....

Nikzad et al 2012 <sup>38</sup>	Journal of dental sciences	<ul style="list-style-type: none"> <li>•micro-ceramic-composite (Gradia)</li> <li>•micro-filled, light/heat-cured veneer composite (SR Adoro)</li> <li>•porcelain</li> </ul>	Indirect composite	coffee nescafe	5 g coffee + 200 mL boiling distilled water	detectable with naked eye E> 1 clinically acceptable E<3.3	2 weeks	GC Gradia> Adora > Porcelain
Palla et al 2018 <sup>52</sup>	Journal of Prosthetic Dentistry	<ul style="list-style-type: none"> <li>•IPS e max CAD</li> <li>•IPS e max CERAM</li> <li>•IPS e max Press w glazing</li> <li>•IPS e max Press w/o glazing</li> </ul>	CAD-CAM		15 g coffee + 300 mL of boiled, distilled water	Intra-oral perceivable value 3.4	54 h (3 yr clinical simulation)	CERAM > Press w/o glaze > CAD > Press w glaze
Ren et al 2012 <sup>7</sup>	Journal of Dentistry	<ul style="list-style-type: none"> <li>•Filtek Supreme Ultra</li> <li>•TPH3</li> <li>•Renamel</li> </ul>	Direct	Maxwell House 100% pure coffee	10 g coffee + 1000 ml water and boiled for 4 min		coffee thermocycling 1000 cycles	Filtek Supreme Ultra > TPH3 > Renamel
S. Madhyastha et al 2015 <sup>8</sup>	International Journal of Biomedical Science	<ul style="list-style-type: none"> <li>•silorane restorative material (Filtek P90)</li> <li>•methacrylate counterpart (Z100)</li> </ul>	Direct	nescafe sunrise premium	30g coffee + 11 water, boiled for 5 mins		1, 7, 14, 28 days	1,14,28d = Filtek> Z100 7d = Z100 >Filtek
Saba et al 2017 <sup>56</sup>	Future Dental Journal	<ul style="list-style-type: none"> <li>•polymer-infiltrated-ceramic-network (Vita Enamic)</li> <li>•feldspathic ceramic (Vitablocs Mark II)</li> </ul>	Indirect	Nescafe Classic	1g of powder + 10 ml of distilled water		28 days	Vitabloc Mark II > Vita Enamic
Samhan & Samaha et al 2023 <sup>31</sup>	Egyptian Dental Journal	<ul style="list-style-type: none"> <li>•lithium disilicate (E. max CAD)</li> <li>•feldspathic ceramic (Vita Mark II)</li> <li>•microhybrid resin composite (Coltene C Bright)</li> <li>•microhybrid resin composite (Filtek Z250)</li> </ul>	indirect	Nescafe Classic	15 g of coffee powder + 250 ml of boiled distilled water		1, 7d	1, 7d = Coltene C > Filtek 250 > Vita Mark II > E max CAD
Sayed et al 2023 <sup>57</sup>	Egyptian Dental Journal	<ul style="list-style-type: none"> <li>•IPS Emax CAD</li> <li>•Vita Suprinity</li> <li>•Vita Enamic</li> </ul>	indirect	Nescafe	1.8 g of coffee + 150 ml of boiled water	clinically acceptable E<3.3	12days	Vita Enamic > E max CAD > Vita Suprinity
Signore et al 2023 <sup>29</sup>	Journal of contemporary dental practice	<ul style="list-style-type: none"> <li>•feldspathic ceramic (FC)</li> <li>•zirconia-reinforced lithium silicate glass ceramic (LS)</li> <li>•hybrid ceramic (HC)</li> <li>•microparticle composite resin (MPC)</li> </ul>	Indirect  direct	Illy classic	3 tbsp coffee + 600 ml boiling water	perceptability threshold E<1.74 Acceptability threshold E<3.7	72 hours	MPC >liSi> HC > FC
Tan et al 2015 <sup>9</sup>	Journal of Operative Dentistry	<ul style="list-style-type: none"> <li>•3M Filtek Z350XT (ZT)</li> <li>•3M Filtek 350XT Flowable Restorative (ZF)</li> <li>•ShofuBeautiful Flow Plus (BF)</li> <li>•ShofuBeautiful II (B2)</li> <li>•3M Ketac Nano (N100)</li> <li>•3M Photac Fil (PF)</li> </ul>	direct	black coffee		clinically perceivable E>3.3	7 days	N100 > PF > B2 > BF > ZT > ZF
Choudhury et al 2022 <sup>44</sup>	Journal of Pharmaceutical Negative Results	<ul style="list-style-type: none"> <li>•preformed veneers and discs (Edelweiss)</li> <li>Direct composite veneers and discs (Tetric N ceram)</li> </ul>	indirect		3.6g coffee powder + 300ml boiling distilled water	visual perceptable E < 3.3	30 days	Direct composite > Preformed veneers

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Daghrery et al 2023 <sup>45</sup>	Journal of functional biomaterials	<ul style="list-style-type: none"> <li>•C-PRCV systems (Componeer)</li> <li>• E-PRCVs (Edelweiss)</li> <li>3D-printed veneers</li> </ul>	indirect	Nescafe Classic	2 scoops of coffee + 30 mL of boiled water		3,5,7 days	D3 = 3D veneers > E - PRCV = C - PRCV D5 = 3D veneer > E - PRCV > C- PRCV D7 = 3D Veneer = E - PRCV > C- PRCV
Alharbi et al 2021 <sup>40</sup>	Materials MDPI	<ul style="list-style-type: none"> <li>•3D-printed nano-composite resin material</li> <li>milled Cerasmart composite resin material</li> </ul>	indirect	Arpeggio; Nespresso®	espresso coffee using an Arpeggio coffee capsule.		12, 24 days	12D (WHITE/BLACK), 24D (WHITE/BLACK) = 3D > MILLED
Rohym et al 2023 <sup>35</sup>	BMC Oral Health	<ul style="list-style-type: none"> <li>•Omnichroma</li> <li>Venus Pearl</li> </ul>	direct		3.6 g of coffee + 300 ml distilled water, boiling for 10 min		1,14 days	1, 14d = Venus Pearl >Omnichroma
Amar et al 2016 <sup>59</sup>	Compendium of Oral Science Volume	<ul style="list-style-type: none"> <li>•prefabricated veneers (Edelweiss)</li> <li>•Componeer (CMP)</li> <li>Nexco (NEX)</li> </ul>	indirect	instant coffee	48 mg of coffee + 250 ml boiling water		27days	Prefabricated veneer > Componeer> NEX
Alp et al 2018 <sup>53</sup>	Journal of Prosthetic Dentistry	<ul style="list-style-type: none"> <li>•zirconia-reinforced lithium silicate glass-ceramic (ZLS)</li> <li>lithium disilicate glass-ceramic (LDS)</li> </ul>	ZLS – Glazed ZLS- POLISHED LDS – GLAZED LDS - POLISHED	Filter coffee	1 tablespoon coffee + 177 mL water		5000 coffee thermocycling cycles	LDS - P > LDS - G > ZLS - P > ZLS - G
Quek et al 2018 <sup>25</sup>	Journal of esthetic and restorative dentistry	<ul style="list-style-type: none"> <li>•Direct (Filtek Z350XT [ZT]),</li> <li>•indirect (ShofuCeramage [CE])</li> <li>•CAD/CAM (Shofu HC BI)</li> <li>•Lava Ultimate [LU]</li> <li>Vita Enamic [EN]</li> </ul>	CAD CAM		200ml coffee	clinically perceivable E>3.3	7 days	ZT > CE > EN > HC > LU
Alghazali et al 2019 <sup>54</sup>	The Open Dentistry Journal	<ul style="list-style-type: none"> <li>•Feldspathic porcelain</li> <li>•Zircon</li> <li>•E-max Press</li> <li>E-max CAD</li> </ul>	CAD CAM	Arabica coffee			4 weeks	0.6mm glazed = Emax press > Zircon > E max CAD > FP 0.6mm polished = Emax press > E max CAD > FP > Zircon 1mm glazed = E max CAD > E max press > Zircon > FP 1mm polished = zircon > FP > E max CAD > E max press

the influence of manufacturing method and surface treatment on stain susceptibility.

#### **Effect of coffee on color stability of CAD-CAM veneers:**

Comparative studies of lithium disilicate (IPS e.max CAD) and hybrid ceramic (VITA Enamic) under coffee staining have generally shown superior color stability for lithium disilicate and, in several cases, for hybrid ceramics compared with resin-based composites<sup>19,22</sup>. Although VITA Enamic contains a high ceramic fraction (~86%), its dual-network structure includes UDMA and TEGDMA, which may permit water sorption and pigment penetration, explaining the greater discoloration observed in some immersion studies. CAD/CAM materials typically demonstrate better stain resistance than direct or indirect composites due to higher industrial polymerization, increased cross-linking, and reduced porosity<sup>25,46</sup>; however, resin nanoceramics and hybrid ceramics have occasionally exceeded clinical acceptability thresholds after thermocycling in coffee<sup>43</sup>.

Lithium disilicate glass-ceramics consistently exhibit minimal and often clinically imperceptible color changes, supporting their use in esthetic veneers<sup>51</sup>. Zirconia and zirconia-reinforced lithium silicate ceramics also show favorable stability, though extended exposure and surface polishing can increase discoloration compared with glazing<sup>47,52-54</sup>. Feldspathic ceramics remain among the most color-stable materials, likely due to their dense, glassy matrix and absence of resin components<sup>55</sup>. Overall, materials containing organic polymer networks are more susceptible to staining because water absorption can degrade the matrix and facilitate pigment uptake, whereas predominantly ceramic systems demonstrate superior long-term color stability<sup>29,31,57,58</sup>. Overall, CAD/CAM ceramics and indirectly polymerized composites consistently demonstrated superior color stability, attributed to higher monomer conversion, optimized polymerization, and more stable material composition<sup>25-37</sup>.

#### **Conclusion**

This systematic review's findings, together with the possibility of bias, lead to the following conclusion:

- Resin materials that are machined instead of direct or prefabricated exhibit greater color stability.
- Indirect or direct materials do not exhibit the same color stability as resin-based blocks used in CAD/CAM processes.
- Although finishing and polishing techniques can have an impact, the composition of the material determines the colour stability of veneer materials.

#### **Authors contribution statement**

All the authors made a significant contribution to the work reported, whether that is in the conception, study design, execution and interpretation, or all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

**Data availability statement:** Data sharing does not apply to this article as no new data were created or analyzed in this study.

#### **Declaration Section**

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**Ethical approval:** Not applicable

**Competing interests:** All other authors declare that they have no competing interests.

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