International Journal of Community Medicine and Public Health
Khatib SF et al. Int J Community Med Public Health. 2025 Jul;12(7):3423-3428
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20252151

Review Article

Effect of carbonated beverages on composite and ceramic dental restorations

Summer Farouk Khatib[1]*, Mohammed Waleed Nazer[2], Mazen Hussain Alshahrani[3], Kholoud Abdullah Alamri[4], Saja Khalid Al Meshal[5], Abdulzeiz Abdullah Alqahtani[6], Faris Fuad Zagzoog[7]

[1]Department of Dentistry, North Jeddah Specialist Dental Center, King Abdullah Medical Complex, Jeddah, Saudi Arabia
[2]Department of General Dentistry, Ibin Sina National College, Jeddah, Saudi Arabia
[3]Department of Restorative Dentistry, Ministry of Health, Abha, Saudi Arabia
[4]Department of Dentistry, Prince Sultan Medical City, Riyadh, Saudi Arabia
[5]College of Dentistry, Majmaah Unversity, Almajmaah, Saudi Arabia
[6]College of Dentistry, King Khalid University, Abha, Saudi Arabia
[7]Department of Restorative Dentistry, Ibin Sina National College, Jeddah, Saudi Arabia

Received: 05 June 2025
Accepted: 20 June 2025

***Correspondence:**
Dr. Summer Farouk Khatib,
E-mail: khateebs@yahoo.com

ABSTRACT

Dental restorations are challenged by the material-hostile, highly dynamic, and complex environment of the oral cavity. An inadequate existing restoration may lead to various interventions with varying degrees of invasiveness and subsequent consequences for dental prognosis. These consequences may include replacement of the restoration, sealing, refurbishment, or repair procedures. Carbonated beverages can cause significant side effects on oral health and general health. Carbonated beverages can lead to an increased risk of dental caries, dental erosion with dentine hypersensitivity, and periodontitis. Thus, the aim of this review is to discuss the effect of carbonated beverages on two types of dental restorations: composite dental restorations and ceramic dental restorations. Composite dental restoration is the most prevalent dental procedure in advanced dentistry. Carbonated beverages showed significant changes in colour, surface roughness, and flexural strength of composite dental restorations. Furthermore, ceramic dental materials are always preferred since they can visually simulate the character of the tooth substance successfully. Carbonated beverages were also linked to significant effects on the depth of wear, colour stability, and roughness of ceramic dental restorations. Prolonged consumption of carbonated beverages poses a clear risk to the longevity and aesthetic stability of direct dental restorative materials.

Keywords: Carbonated beverages, Composite, Composite dental restoration, Ceramic, Ceramic dental restoration

INTRODUCTION

Dental restorations have a wide variety of forms and shapes in dentistry; they are challenged by the material-hostile, highly dynamic, and complex environment of the oral cavity.[1] The clinical success of a restoration is essentially measured by its long-term durability.[2] Material durability plays a great role in the capacity to withstand various external forces, including those of a chemical, mechanical, biological, and thermal nature.[1,3] An inadequate existing restoration may lead to various interventions with varying degrees of invasiveness and subsequent consequences for dental prognosis.[4]

These consequences may include replacement of the restoration, sealing, refurbishment or repair procedures, up to endodontic treatment, which may be alongside prosthetic restoration, tooth-preserving surgery, or even extraction, known as a "death spiral" and "patient's lifetime restorative cycle".[5-7] Replacement of restoration results in increased risk of iatrogenic tooth damage and cavity enlargement, damage to adjacent anatomical structures, and compromise of the pulpal vitality. It also leads to the next more invasive procedure.[8-10] Thus, it is important that dentists do each therapeutic intervention with maximum care, conservatism, predictability, and longevity.[7,8]

Dietary behavior has become under observation for clinicians and patients in recent years. It has garnered substantial and continuous attention in both the pertinent literature and the public media.[4] Recently, more focus has been targeted towards carbonated, sugary, and acidic foods, such as soft drinks, due to their erosive and cariogenic nature which can worsen the oral health.[11] Carbonated beverages can cause significant side effects on oral health and general health. Although the food and drug administration indicated that the ingredients in such drinks are safe, they still have side effects, particularly with prolonged consumption.[12] It is important to be aware of the side effects of these carbonated beverages when making a diet plan and nutritional choices.

Multiple studies have evaluated the effects of carbonated beverages on normal teeth and dental restorations materials functions. Carbonated beverages (e.g. Soft drinks) can lead to demineralization processes and loss of substance by various mechanisms, including the direct erosive effect on the hard tooth substance exposed to the medium that can be regarded as a probable element of exogenous 'biocorrosion', the elevated tooth wear which occurs due to the combined interactions between erosion, attrition, and abrasion, and the fermentable carbohydrates that act as a microbial substrate and elevate the metabolic activity of the plaque.[13-16] This can result in increased risk of dental caries, dental erosion with dentine hypersensitivity, periodontitis, impaired aesthetic appearance and function, pain, and ultimately tooth (substance) loss, particularly when consumed in high-frequency and between-meal.[16-18]

Considering the longstanding and widespread global rise in carbonated beverage consumption across various age groups over the past decades, it is essential to thoroughly examine their potential effect on the function of various dental restorative materials.[4] Thus, the aim of this review is to discuss the effect of carbonated beverages on two types of dental restorations: composite dental restorations and ceramic dental restorations.

LITERATURE SEARCH

A comprehensive literature search was performed in PubMed, Scopus, and Embase of until April 23, 2025, using combinations of the following keywords: "carbonated beverages", "composite dental restorations", and "ceramic dental restorations" and related MeSH terms. Studies were included if they addressed effect of carbonated beverages on composite and ceramic dental restorations. All languages are included. Full-text articles, case series, and abstracts with the related topics are included. Case reports, comments, animal studies and letters were excluded.

DISCUSSION

Composite dental restoration

Composite dental restoration is the most prevalent and significant dental procedure in advanced dentistry. It is commonly recognized and used by both dental professionals and patients globally, confirming its popularity and effectiveness. Composite resin material is usually formed of Bis-GMA and other di-methacrylate monomers. It is a popular alternative to silver fillings. While these materials possess sufficient strength, they may not match the hardness of amalgam fillings. Additionally, some studies suggest they could have adverse effects on the oral environment.[19] Various types of composite restorations are available such as conventional (macro-filled) composites, micro-filled composites, hybrid composites, micro-hybrid composites, nano-filled composites, bulk-fill composites, flowable composites, and packable (condensable) composites.

Carbonated beverages effect on composite dental restoration

A recent study investigated the effect of carbonated beverages on two types of composite restorative materials commonly used in dentistry which are bulk fill and regular flowable composite.[20] Color stability of the composite materials was measured by determining the delta E value. The used beverages (Appy fuzz and 7up) in the study showed significant color changes in both composites; however, the bulk fill resin showed more color change than the flowable composite, indicating that they are less color stable. Discoloration of tooth-colored normal and bulk fill resin composite materials is considered a major cause of dental restoration replacement in cosmetic field. Both dentists and patients are affected by this complication. To overcome discoloration, various cosmetic restorative materials have been assessed *in vitro* for color stability.[20]

In previous studies, carbonated beverages resulted in increased staining by weakening the resin matrix of composites. Carbonated beverages also resulted in surface roughness on composite filled teeth.[21] In addition, a recent study showed a remarkable color difference in flowable composites and bulk fill resin when immersed in the carbonated beverages. The delta E value estimated by this study was >3.5 times that is regarded as a remarkable color change in the composite materials. It was also regarded as clinically unacceptable and visually visible.[22]

Future research should focus on evaluating the color stability of various composite materials to enhance the quality of dental restorations. Such studies can assist dental practitioners in selecting the most suitable composite material that meets both clinical requirements and patient expectations.

Another study evaluated the effect of carbonated beverages on the flexural strength of two types of composites samples: Ivoclar and Restofill.[12] The flexural strength was measured before and after immersion in carbonated drinks by putting samples in a three-point bend test with a span length of 16 mm and a crosshead speed of 1 mm/min on an INSTRON E3000 universal testing machine (ElectroPuls), the maximum force and flexural displacement were measured. The study showed that, before immersion, the Ivoclar composite has a flexural strength of 59.79 MPa, while after immersion, the flexural strength of two Ivoclar samples increased to 69.12 MPa and decreased to 48.69 MPa in Sprite and Coke, respectively.[12] On the other hand, the Restofill composite showed a flexural strength of 95.37 MPa before immersion, while after immersion, the flexural strength of two Restofill samples showed a decreased flexural strength to 49.02 and 21.00 MPa in Coke and Sprite, respectively. Thus, a reduction occurred in flexural strength of both the Restofill and Ivoclar composites after immersion in carbonated beverages such as Sprite and Coke.[12]

Cola soft drinks are considered the most recognized carbonated soft drinks, especially the one presented by the Coca-Cola brand.[4] As a globally recognized company with strong brand equity, The Coca-Cola company actively promotes its products across numerous countries, maintaining a consistent brand presence in our daily lives through impactful and well-executed advertising strategies.[23]

Multiple studies have evaluated the effects of Coca-Cola on normal teeth and dental restorations materials functions. In general, soft drinks can lead to demineralization processes and loss of substance by various mechanisms: (1) the direct erosive effect on the hard tooth substance exposed to the medium that can be regarded as a probable element of exogenous ‘biocorrosion’, (2) the elevated tooth wear which occurs due to the combined interactions between erosion, attrition, and abrasion, (3) the fermentable carbohydrates that act as a microbial substrate and elevate the metabolic activity of the plaque.[13-16]

This can result in increased risk of dental caries, dental erosion with dentine hypersensitivity, periodontitis, impaired aesthetic appearance and function, pain, and ultimately tooth (substance) loss, particularly when consumed in high-frequency and between-meal.[16-18]

A recent study investigated the effect of Coca-Cola on direct restorative materials, including composite dental restorations.[4] The study demonstrated that Coca-Cola results in moderate color changes in composited, particularly flowable, bulk-fill, micro-hybrid, and nanohybrid types. Color changes always tend to be brownish or yellowish hues.[2,24,25] Notably, the discoloration increases with repeated or prolonged exposure, which means it is time- and frequency-dependent.[2,26] Coca-Cola also leads to a reduction in surface hardness of composite materials, especially during the initial phase of exposure.[27,28] Furthermore, microhardness loss was observed in various studies which is caused by sorption and matrix degradation, particularly in micro-hybrid, nanohybrid, and flowable composites.[29-31] On the other hand, various studies reported that Coca-Cola has no effect on elasticity, compressive strength, and flexural strength of composites unless exposure is prolonged.[32-34]

Exposure to Coca-Cola results in surface degradation, including matrix breakdown, microcracks, increased surface roughness, and pore formation, particularly in bulk-fill and flowable composites.[25,35,36] Notably, roughness correlates with longer contact time and exposure frequency and these roughness surfaces are more prone to discoloration and mechanical wear.[2,27,35] In addition, Coca-Cola can cause chemical changes such as monomer elution (TEGDMA, UDMA, Bis-GMA) from nanohybrid composites, indicating chemical degradation.[38] When surface analysis was done, phosphoric acid interaction with polymer matrices occurred, changing elemental composition.[39,40]

Biological effects for Coca-Cola on composite dental restorations were also observed, as it increased bacterial biofilm accumulation, especially in degraded or roughened areas.[41,42] Coca-Cola can impair marginal adaptation and increase microleakage at the restoration-tooth interface, especially in bulk-fill and conventional composites.[29]

Ceramic dental restorations

Ceramics are inert and biocompatible materials which can be safely used in the oral cavity due to their high degree of intra-oral stability. However, the brittle nature of ceramics makes them prone to be easily fractured.[43] Therefore, ceramics are supported by metal, reinforced with particles, or made purely of polycrystalline material to overcome this weakness. Ceramic dental materials are always the materials of choice when aesthetics are of utmost importance, since they can visually simulate the character of the tooth substance successfully.[44] This is why the usage of ceramic dental restorations has greatly increased in recent years.[45,46] There is a wide variety of ceramic materials and devices available on the market for use in dentistry, such as Feldspathic porcelain, Lithium disilicate (e.g., IPS e.max), Zirconia, and porcelain-fused-to-metal (PFM).[43,47,48] All-ceramic restorations may be fabricated as bi-layered systems, where a core or framework is overlaid with more aesthetic veneering ceramics. Alternatively, they can be produced as full-contour (monolithic) restorations, which can be stained to enhance their appearance when needed.[49]

Carbonated beverages effect on ceramic dental restorations

Al-Hiyasat et al investigated the effect of carbonated beverage on the wear of human enamel and different ceramic dental restorations materials.[50] Three dental ceramics were investigated: a machinable ceramic (Vita Mark II), a hydrothermal low-fusing ceramic (Duceram-LFC), and a conventional porcelain (Vitadur Alpha).

The study tested the tooth-against-ceramic specimens in a wear machine at a rate of 80 cycles per minute, under a load of 40 N and for a total of 25,000 cycles. It was done with intermittent exposure to a carbonated beverage (Coca-Cola) or in distilled water. The depth of wear track in the ceramic specimens and the height reduction of the tooth specimens were both measured to detect wear. Results showed that Duceram-LFC, alpha porcelain led to similar enamel wear when exposed to carbonated beverages, while Vita Mark II produced the least amount of enamel wear. Overall, Duceram-LFC and Vita Mark II had increased wear with exposure to the carbonated beverages.[50]

Another study evaluated the effect of carbonated beverages (Coca-Cola) along with other substances on the surface roughness of two ceramic dental materials (IPS e.max Ceram and Noritake).[51] Noritake® super porcelain EX-3 is a high-quality dental ceramic designed for metal-ceramic restorations, such as crowns and bridges. It is renowned for its stable coefficient of thermal expansion, allowing repeated firings without compromising structural integrity and ideal for complex cases like long-span bridges. IPS e.max® Ceram is a fluorapatite glass-ceramic veneering material developed by Ivoclar. It is designed to provide highly esthetic and natural-looking restorations when layered over lithium disilicate (IPS e.max) or zirconia frameworks.[51]

Two methods to measure surface roughness are currently available: contact and non-contact methods.[52] The contact method, which was used in this study, operates by moving the stylus vertically along the object's surface, tracing its profile as it goes. While the non-contact methods usually utilize a laser beam or a light+ beam to obtain a surface profile. However, shiny surfaces cause a scattering effect of the reflected light making it harder to measure these surfaces, leading to false documented values.[52] Results showed that the surface roughness increased, in all dimensions, when both Noritake and IPS e.max ceram were immersed in Coca-Cola.[51]

Furthermore, a previous study evaluated the effect of Coca-Cola and other beverages (green tea and coffee) on the surface changes, including mean color changes, depth, and roughness on computer-aided design-computer-aided manufactured (CAD/CAM) ceramic veneers materials of varying thicknesses using digital spectrophotometer.[53] The study stated that Coca-Cola can dissolve alkaline ions and silica from ceramics glaze layer resulting in surface corrosion, higher color change, and increased surface roughness. Results showed that Coca-Cola caused greater color change than other tested beverages. Additionally, significant differences in color stability were noted especially in thicker ceramic samples (1.00 mm) when immersed in Coca-Cola compared to thinner ones (0.07 mm).[53] Color change values exceeded clinically acceptable thresholds (over 4.2 units in some cases), indicating visible and unacceptable color change. These results are supported by similar findings in multiple previous studies.[54-56]

CONCLUSION

The frequent consumption of carbonated beverages poses a clear risk to the longevity and aesthetic stability of direct dental restorative materials, particularly composites. While extensive research has documented the detrimental effects on composite restorations, studies examining ceramic restorations remain comparatively scarce. Given the growing popularity and clinical use of ceramic materials, further high-quality investigations are warranted to better understand their behavior and degradation mechanisms in response to acidic challenges, ensuring informed material selection and enhanced patient care.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Szczesio-Wlodarczyk A, Sokolowski J, Kleczewska J, Bociong K. Ageing of Dental Composites Based on Methacrylate Resins-A Critical Review of the Causes and Method of Assessment. Polymers. 2020;12(4):882.
2. Savas S, Colgecen O, Yasa B, Kucukyilmaz E. Color stability, roughness, and water sorption/solubility of glass ionomer-Based restorative materials. Nig J Clin Pract. 2019;22(6):824-32.
3. Stewart CA, Finer Y. Biostable, antidegradative and antimicrobial restorative systems based on host-biomaterials and microbial interactions. Dental Materials. 2019;35(1):36-52.
4. Schnell CP, Türp JC, Kessler P. The influence of carbonated beverages on direct dental restorative materials - a systematic review exemplified on Coca-Cola. Swiss Dental J. 2025;135(1):38-128.
5. Fdi World Dental F. Repair of restorations: Adopted by the General Assembly: September 2019, San Francisco, United States of America. Int Dental J. 2020;70(1):7-8.

6. Qvist V. Longevity of restorations: the 'death spiral'. In: Dental Caries: The disease and its clinical management. 2008;444-55.
7. Boyer KR. Saving Teeth for Life. J California Dental Assoc. 2023;51(1):2262634.
8. Brantley CF, Bader JD, Shugars DA, Nesbit SP. Does the cycle of rerestoration lead to larger restorations? J Am Dental Assoc. 1995;126(10):1407-13.
9. Elderton RJ. Preventive (evidence-based) approach to quality general dental care. Med Principles Pract. 2003;12(1):12-21.
10. Opdam NJ, Bronkhorst EM, Loomans BA, Huysmans MC. Longevity of repaired restorations: a practice based study. J Dentistr. 2012;40(10):829-35.
11. Cheng R, Yang H, Shao MY, Hu T, Zhou XD. Dental erosion and severe tooth decay related to soft drinks: a case report and literature review. J Zhejiang University Sci B. 2009;10(5):395-9.
12. Sushma B, Ganesh SB, Jayalakshmi S. Effect of carbonated beverages on flexural strength of composite restorative material. J Adv Pharmaceut Technol Res. 2022;13(1):S160-3.
13. Fernández CE, Brandao ACS, Bícego-Pereira EC, Del Bel Cury AA, Cury JA, Tenuta LMA. Effect of pH and titratable acidity on enamel and dentine erosion. Clin Oral Invest. 2022;26(9):5867-73.
14. Grippo JO. Biocorrosion vs. erosion: the 21st century and a time to change. Compendium of continuing education in dentistry (Jamesburg, NJ : 1995). 2012;33(2):e33-7.
15. Addy M, Shellis RP. Interaction between attrition,abrasion and erosion in tooth wear. Monographs Oral Sci. 2006;20:17-31.
16. Shenkin JD, Heller KE, Warren JJ, Marshall TA. Soft drink consumption and caries risk in children and adolescents. General Dentistr. 2003;51(1):30-6.
17. Carvalho TS, Colon P, Ganss C, Huysmans MC, Lussi A, Schlueter N, et al. Consensus report of the European Federation of Conservative Dentistry: erosive tooth wear--diagnosis and management. Clin Oral Investigat. 2015;19(7):1557-61.
18. Çetinkaya H, Romaniuk P. Relationship between consumption of soft and alcoholic drinks and oral health problems. Central Europ J Publ Heal. 2020;28(2):94-102.
19. Collins CJ, Bryant RW, Hodge KL. A clinical evaluation of posterior composite resin restorations: 8-year findings. J Dentistr. 1998;26(4):311-7.
20. Noufal ZM, Ganesh SB, Jayalakshmi S. Effect of carbonated beverages on the color stability of bulk and flowable composite resin. J Adv Pharmaceut Technol Res. 2022;13(1):S144-7.
21. Al-Dharrab A. Effect of energy drinks on the color stability of nanofilled composite resin. J Contemporary Dental Pract. 2013;14(4):704-11.
22. Pepelascov DE, de Castro-Hoshino LV, da Silva LH, Ronaldo H, Francielle S, Mauro LB, et al. Opalescence and color stability of composite resins: an *in vitro* longitudinal study. Clin Oral Investigat. 2022;26(3):2635-43.
23. Sathan D, Oogarah-Hanuman V, Ramsaran R. Analysing the impact of advertising in the soft drink market of Mauritius: The case study of Coca-Cola. 2012.
24. Mohamad-Kharib A, Chamorro-Petronacci C, Pérez Jardón A, et al. Staining Susceptibility of Microhybrid and Nanohybrid Composites on Exposure to Different Color Solutions. Applied Sci. 2023;13:11211.
25. Özyurt E, Kurt A. Color stability of bulk-fill resin composites exposed to caffeinated beverage: An *in vitro* study. Am J Dentistr. 2022;35(1):3-8.
26. Karatas O, Gul P, Akgul N, Neslihan C, Gundogdu M, Duymus ZY, et al. Effect of staining and bleaching on the microhardness, surface roughness and color of different composite resins. Dental Med Prob. 2021;58(3):369-76.
27. Rathod A, Vadavadagi SV, Verma T, Pawan K, Deepak PV, Deb S, et al. Effect of Acidic Beverages on Color Stability and Microhardness of Various Esthetic Restorative Materials: A Comparative Study. J Pharmacy Bioallied Sci. 2021;13(2):S1084-7.
28. Colombo M, Gallo S, Poggio C, Ricaldone V, Arciola CR, Scribante A. New Resin-Based Bulk-Fill Composites: *in vitro* Evaluation of Micro-Hardness and Depth of Cure as Infection Risk Indexes. Materials (Basel, Switzerland). 2020;13(6):1308.
29. Cavalheiro JP, Souza M, Jeremias F. Effect of erosive challenge before and after the restoration of primary teeth. General Dentistr. 2020;68(5):36-41.
30. de Paula AB, de Fúcio SB, Alonso RC, Ambrosano GM, Puppin-Rontani RM. Influence of chemical degradation on the surface properties of nano restorative materials. Operative Dentistr. 2014;39(3):E109-17.
31. Gupta R, Madan M, Dua P, Sheeba S, Mangla R, Kainthla T, et al. Comparative Evaluation of Microhardness by Common Drinks on Esthetic Restorative Materials and Enamel: An *in vitro* Study. Int J Clin Pediatr Dentistr. 2018;11(3):155-60.
32. Szalewski L, Wójcik D, Bogucki M, Szkutnik J, Różyło-Kalinowska I. The Influence of Popular Beverages on Mechanical Properties of Composite Resins. Materials (Basel, Switzerland). 2021;14(11):3097.
33. Scribante A, Gallo S, Scarantino S, Dagna A, Poggio C, Colombo M. Exposure of Biomimetic Composite Materials to Acidic Challenges: Influence on Flexural Resistance and Elastic Modulus. Biomimetics (Basel, Switzerland). 2020;5(4):56.
34. Scribante A, Bollardi M, Chiesa M, Poggio C, Colombo M. Flexural Properties and Elastic Modulus of Different Esthetic Restorative Materials: Evaluation after Exposure to Acidic Drink. Biomed Res Int. 2019;2019:5109481.
35. Ipek İ, Bilge K. The effect of different liquids on the surface roughness and color stability of single shade

and nanohybrid resin composites: An AFM and SEM analysis. Microscopy Res Tech. 2024;87(9):2063-71.
36. Singh T, V M, Sahu S, Silpi C, Khan AM, Haqh MF, et al. A Comparative Evaluation of the Effect of Different Beverages on Colour Stability and Surface Micromorphology of Nanocomposite Restorative Material. Cureus. 2023;15(7):e41905.
37. Chowdhury D, Mazumdar P, Desai P, Datta P. Comparative evaluation of surface roughness and color stability of nanohybrid composite resin after periodic exposure to tea, coffee, and Coca-cola-An *in vitro* profilometric and image analysis study. J Conservative Dentistr. 2020;23(4):395-401.
38. Mourouzis P, Vladitsi M, Nikolaou C, Kalogiouri NP, Samanidou V, Tolidis K. Monomers Release from Direct and Indirect Resin-Based Restorations after Immersion in Common Beverages. Polymers. 2022;14(23):5158.
39. Abdelhameid B, Metwally A, Shalaby H. Rational durability of optical properties of chameleon effect of Omnichroma and Essentia composite thermocycled in black dark drinks (*in vitro* study). Bull National Res Centre. 2022;46.
40. Karakaş SN, Küden C. AFM and SEM/EDS characterization of surfaces of fluorine-releasing bulk-fill restorative materials aged in common liquids. J Oral Sci. 2022;64(3):202-7.
41. Poggio C, Vialba L, Marchioni R, Colombo M, Pietrocola G. Esthetic restorative materials and glass ionomer cements: Influence of acidic drink exposure on bacterial adhesion. Eur J Dentistr. 2018;12(2):204-9.
42. Kurt A, Özyurt E, Topcuoğlu N. Effect of different beverages on surface properties and cariogenic biofilm formation of composite resin materials. Microscopy Res Techn. 2021;84(12):2936-46.
43. Sharkey S. Metal ceramic versus all ceramic restorations: part 1. J Irish Dental Assoc. 2010;56(4):196-9.
44. Contrepois M, Soenen A, Bartala M, Laviole O. Marginal adaptation of ceramic crowns: a systematic review. J Prosthet Dentistr. 2013;110(6):447-54.
45. Zarone F, Di Mauro MI, Ausiello P, Ruggiero G, Sorrentino R. Current status on lithium disilicate and zirconia: a narrative review. BMC Oral Health. 2019;19(1):134.
46. Zarone F, Russo S, Sorrentino R. From porcelain-fused-to-metal to zirconia: clinical and experimental considerations. Dental Materials. 2011;27(1):83-96.
47. Kelly JR. Dental ceramics: current thinking and trends. Dental Clin N Am. 2004;48(2):513-30.
48. Raigrodski AJ. All-ceramic full-coverage restorations: concepts and guidelines for material selection. Pract Procedures Aesthet Dentistr. 2005;17(4):249-56.
49. Warreth A, Elkareimi Y. All-ceramic restorations: A review of the literature. Saudi Dental J. 2020;32(8):365-72.
50. Al-Hiyasat AS, Saunders WP, Sharkey SW, Smith GM. The effect of a carbonated beverage on the wear of human enamel and dental ceramics. J Prosthodont. 1998;7(1):2-12.
51. Zakir T, Dandekeri S, Suhaim KS, Shetty NHG, Ragher M, Shetty SK. Influence of Aerated Drink, Mouthwash, and Simulated Gastric Acid on the Surface Roughness of Dental Ceramics: A Comparative *In Vitro* Study. J Pharmacy Bioallied Sci. 2020;12(1):S480-7.
52. Whitehead SA, Shearer AC, Watts DC, Wilson NH. Comparison of methods for measuring surface roughness of ceramic. J Oral Rehabilit. 1995;22(6):421-7.
53. Al Wadei MHD. Comparison of the Degree of Staining of Computer-Aided Design-Computer-Aided Manufacture (CAD-CAM) Ceramic Veneers by Green Tea, Coffee, and Coca-Cola Using a Digital Spectrophotometer. Med Sci Monitor. 2023;29:e939341.
54. Alghazali N, Burnside G, Moallem M, Smith P, Preston A, Jarad FD. Assessment of perceptibility and acceptability of color difference of denture teeth. Journal of dentistry. 2012;40(1):e10-7.
55. Abdalkadeer HK, Almarshedy SM, Al Ahmari NM, Al Moaleem AM, Aldosari AA, Al Ghazali NA. Influence of the Coca-Cola Drinks on the Overall Color of Glazed or Polished Porcelain Veneers Fabricated from Different Materials and Thicknesses: An *In Vitro* Study. J Contemporary Dental Pract. 2020;21(1):56-61.
56. Adawi HA, Al Mialeem MM, Al Ahmari NM, Mansoor S, Mohammed AQ, Muharraq SMH, et al. Assessment of Color Stainability of Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) Ceramic Materials After Hot and Cold Coffee Immersion at Different Time Intervals. Med Sci. 2021;27:e932745.

Cite this article as: Khatib SF, Nazer MW, Alshahrani MH, Alamri KA, Al Meshal SK, Alqahtani AA, et al. Effect of carbonated beverages on composite and ceramic dental restorations. Int J Community Med Public Health 2025;12:3426-8.