

Review Article

Beyond the surface: understanding dentine hypersensitivity through literature and expert opinion

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ABSTRACT

Dentine hypersensitivity (DH) is a prevalent condition marked by acute, transient pain resulting from exposed dentine, which can severely impact a patient's quality of life and daily activities. The transient and often underreported nature of DH complicates both diagnosis and management. This expert opinion addresses current diagnostic and therapeutic approaches for DH, with a specific focus on practices within Indian clinical settings. Diagnosis necessitates a detailed patient history, clinical examination and the application of various stimuli to confirm hypersensitivity whilst excluding other dental pathologies. Enhanced diagnostic protocols and advancements in biomaterials are crucial for optimizing DH management and improving patient outcomes. The experts discussed current clinical practices and future directions in managing DH, with a focus on bioactive glasses like BioMin® that may be used to reduce tooth sensitivity and protect against tooth decay.

Keywords: BioMin®, Desensitizing agents, Dentine hypersensitivity, Oral health, Remineralization

INTRODUCTION

DH presents a significant global oral health challenge, especially among adults.¹ The 2003 Canadian consensus defines DH as "pain derived from exposed dentine in response to chemical, thermal tactile or osmotic stimuli which cannot be explained as arising from any other dental defect or disease".² Gibson et al described DH's impact on daily activities like drinking cold water (28.2%), eating ice cream (26.5%), toothbrushing and in severe cases, even breathing, affecting quality of life (QOL).^{3,4} Prevalence data vary widely: clinical studies show the rate of 15-30%, while questionnaires may overestimate up to 74%, revealing a gap between perceived and actual prevalence.^{5,6} Recent reviews suggest a 10% prevalence, affecting 40% of the global population.^{3,7} DH is characteristically transient and

episodic, leading to underreporting and underdiagnosis.³ Dental professionals face challenges due to numerous treatment options and products, impacting their confidence in managing DH.^{8,9} Acknowledging the widespread prevalence and impact of DH, it became imperative to address the clinical challenges and disparities in implementation, specific to healthcare in India.

Expert opinions and focus group discussions can provide useful insights in clinical research, especially when empirical data is plentiful. Qualitative approaches provide a more profound investigation of intricate matters, such as patient experiences, ethical considerations or social repercussions. They have the ability to reveal subtle viewpoints, recognize unforeseen obstacles and contribute to the creation of more extensive and culturally

aware remedies. Moreover, the insights of field experts may offer a framework and analysis for current factual information, enabling the connection between research discoveries and real-world implementation. This expert opinion aims to address DH management in Indian settings and propose future directions with new materials and treatment protocols to improve patient care and outcomes.

A focus group was convened in March 2024 with the intention to identify clinical practices, assess DH symptomatology, diagnosis and management and explore future treatment advancements. An expert panel of eleven dentists, specializing in Periodontics, Prosthodontics, Endodontics and General Dentistry, each with over 15 years of experience, reviewed literature and discussed treatment options. Recommendations emphasized enhancing DH management, particularly highlighting the potential efficacy of innovative materials like BioMin® for tubule occlusion and remineralization.

LITERATURE REVIEW AND EXPERT OPINION

Exploring patient profiles and aetiology of dentine hypersensitivity

Incidence and prevalence

Literature evidence

DH affects a significant proportion of adults, with reported prevalence rates of 33.5% (95%CI: 30.2–36.7) worldwide.¹⁰ The diagnostic method used, significantly influences prevalence estimates, with self-reported questionnaires often yielding higher figures than those supported by clinical examinations.^{10,11} Contributing factors include enamel wear; dentine exposure due to non-carious tooth surface loss, attrition, abrasion, abfraction, erosion; bruxism; gingival recession; and use of abrasive dental products like whitening agents.¹²

Brannstrom's hydrodynamic theory underpins the understanding of the pathophysiology of DH, attributing it to fluid flow within dentinal tubules triggered by various stimuli such as temperature changes, brushing and osmotic stimuli over exposed dentine surfaces.¹²⁻¹⁴ DH often coexists with chronic periodontal disease due to root surface exposure caused by disease progression.¹⁵

DH frequently affects the buccal-cervical regions of canines and premolars and is most prevalent in individuals aged 20-50, with a notable concentration between 30 and 40 years.¹⁴ Prevalence decreases with age, potentially due to the protective effect of secondary dentine formation in older adults.^{10,16} As per studies, the prevalence of DH is higher in females, due to hormonal influences, oral hygiene habits and dietary differences.^{13,17-20} Few studies indicate a higher incidence of DH during colder months.²¹

Expert opinion

In addition to the above-stated etiologic factors, the experts opined that faulty oral hygiene practices especially, overzealous tooth brushing causing cervical abrasions and gingival recession is the most prevalent aetiology. They added that biofilm-induced plaque acids, unhealthy diet, parafunctional habits like bruxism leading to abfraction lesions and attrition and conditions such as acid reflux from GERD or bulimia are also not so rare observed clinical entities.

Experts have observed that DH commonly affects adults aged 40-60 years; prevalence declines after 60 due to reduced pulp sensitivity and calcification. Females exhibit slightly higher rates, potentially linked to greater dental awareness, care-seeking behaviour and varying pain perception. Cold weather exacerbates DH through vasodilation and dentine desiccation, increasing fluid movement in dentinal tubules. Seasonal changes in weather, such as from warm to cold, may lead to an increase in sensitivity; similarly, from cold to warm, leading to increased consumption of cold water/aerated beverages, can lead to an increase in sensitivity.

Patient journey

Literature evidence

Patients with DH experience significant daily disruptions, including pain while eating, drinking, speaking and brushing. This can lead to frustration and avoidance of certain foods and beverages, particularly cold items in hot weather. Patients often describe their discomfort as a “very uncomfortable” ache forcing the patient to stop eating or drinking in order to control the pain.²²⁻²⁴ These disruptions can significantly impact QOL and prompt patients to seek dental care.

The diagnostic process for DH can be challenging and may be delayed, due to its fluctuating symptoms and the variety of available treatment options.^{8,9} Over-reliance on over-the-counter (OTC) products can overlook underlying etiological factors.^{25,26} Hypersensitivity from scaling, periodontal therapy, restorations, endodontic treatment, soft tissue injuries during dental procedures usually resolves with self-treatment or over time (2-4 weeks).²⁷ Chronic exposure to erosive factors or functional issues may lead to persistent symptoms.^{23,28}

Expert opinion

Experts observe that mild to moderate DH often goes unnoticed until significant discomfort arises. Patients progress through stages of avoidance i.e., avoiding triggers that exacerbate sensitivity, adaptation i.e., modifying behaviours like waiting for foods to reach tolerable temperatures, compromise i.e., acknowledging functional limitations impacting QOL. Patients often start management with the use of OTC desensitizing products

due to convenience and cost. This delay in seeking professional care can exacerbate dental issues and increase the required professional management especially when DH is caused by microleakage or carious lesions. Relapse commonly occurs within 2 to 4 weeks after discontinuing desensitizing toothpaste as OTC products offer temporary relief, but they do not address underlying causes.

Diagnosis of dentine hypersensitivity

Literature evidence

The diagnosis of DH requires meticulous exclusion through comprehensive patient history followed by clinical examination to rule out other causes of dental pain.^{14,29} Detailed inquiries into erosion and abrasion-related dietary habits and oral hygiene practices are critical to differentiate DH from conditions like pulpal inflammation, periodontal pain and cracked tooth syndrome.^{3,27,29} Verbal screenings should explore pain onset, location, intensity, exacerbating or alleviating factors, including reactions to oral hygiene routines and dental procedures like scaling, root planning and bleaching.^{26,29,30} Clinical examination identifies sensitive teeth and confirms contributing factors of DH such as dental erosion, gingival recession and exposed cervical dentine. Various stimuli thermal, evaporative, mechanical and chemical are used to elicit symptoms and assess pain severity.^{3,27}

Diagnostic tools like cold air blasts, ice sticks, ethyl chloride and cold-water tests assess responses to thermal and evaporative stimuli.³ Cold air is applied at 19-24°C and 45 psi, potentially causing temperature changes if prolonged.

Cold water (0-20°C) is used for 3-second intervals with 3-minute breaks to pinpoint DH thresholds precisely. Mechanical stimuli involve sharp explorers or dental probes applying incremental pressure (e.g., 5 grams) until pain is elicited. Chemical stimuli like hypertonic solutions (sodium chloride, glucose, sucrose) are less effective due to their inability to elicit a graded response.^{6,26,31} Electrical pulp testers and dental pulp stethoscopes elicit short, sharp pain responses but may vary due to current dispersion through periodontal tissues.³¹ Additional diagnostic methods include percussion, palpation, radiographic investigations, vitality tests and transillumination to rule out other causes of dental pain.^{5,6,17} Verbal rating scales (VRS) and visual analog scales (VAS) assess pain levels, with VAS measuring pain on a 10-cm line from "0" (no pain) to "10" (worst pain) and VRS categorizing pain into levels (e.g., 0-3) using verbal descriptors like "no discomfort" to "severe discomfort lasting over 10 seconds".^{23,32} VAS provides subjective tracking of pain intensity, while VRS simplifies communication between patients and healthcare providers; chosen based on clinical needs and research goals.³¹ Objective evaluations involve applying thermal, evaporative, mechanical or chemical stimuli to elicit short, sharp pain responses for DH diagnosis, emphasizing careful application to minimize discomfort and ensure validity.^{6,26}

Expert opinion

Experts note that diagnosing DH is challenging due to its transient nature, fluctuating and overlapping symptoms similar to caries, pulpitis and cracked tooth syndrome, complicating the differential diagnosis and may often lead to delayed treatment. Limited awareness and oral health education, contribute to underreporting.

Previous Dental Treatment • Have you had any previous dental treatment?
Presence or History of Hypersensitive Teeth • Do you currently experience hypersensitive teeth? • Have you experienced hypersensitive teeth in the past?
Details about Hypersensitivity • What do you believe is the probable cause of your hypersensitive teeth? • How long have you been experiencing hypersensitive teeth?
Stimuli and Pain • What types of stimuli cause pain in your daily life?
Treatment Attempts • Have you attempted any treatments for your hypersensitive teeth? If so, what treatments have you tried?

Figure 1: Hypersensitivity questionnaire.

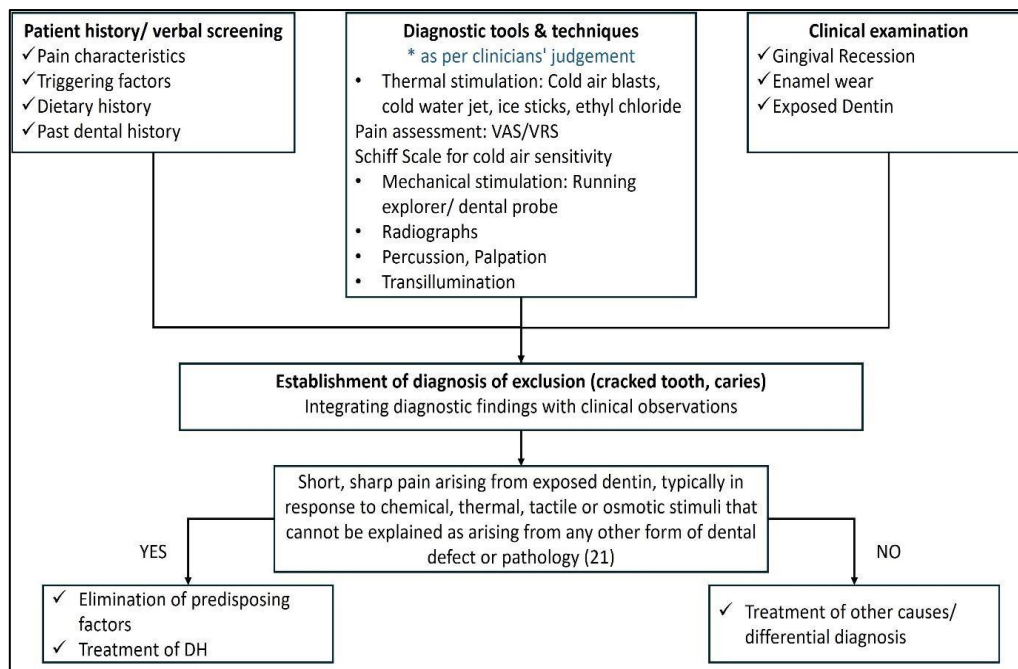


Figure 2: Proposed diagnostic algorithm for dentinal hypersensitivity.

Experts recommend a comprehensive approach: detailed dental and medical history to identify underlying causes, rubber dam isolation for eliminating confounding factors (moisture, adjacent tooth interference) and thermal and mechanical stimulation for eliciting hypersensitive responses. Assessment tools like the VAS and VRS are essential for translating severity and frequency of DH. The Schiff Scale helps assess cold air sensitivity.^{30,33} Radiographic imaging detects underlying conditions, contributing to an accurate diagnosis. Integrating these tools and methods ensure precise diagnosis and effective treatment planning. Figure 1 depicts a questionnaire used by Fischer et al to assess hypersensitivity in patients.³⁴

Treatment of dentine hypersensitivity

Different factors while considering a desensitising agent

Literature evidence

Accurate diagnosis of Dentine hypersensitivity necessitates an understanding of the etiopathogenesis and considering factors such as saliva composition, dental plaque, acid production in biofilm, oral demineralization potential, tooth and gingiva morphology, along with self-cleansing mechanisms.^{2,35} While guidelines do not establish a specific duration for using desensitizing toothpaste, studies suggest around four weeks for effectiveness.³⁵⁻³⁷ Research by Jang et al, shows that longer use of desensitizing toothpaste correlates with greater reduction in DH symptoms, emphasizing the need for a comprehensive approach to DH management with desensitizing agents.³⁸

Expert opinion

Experts advocate addressing the underlying causes of DH rather than focusing solely on symptoms. Potassium nitrate depolarizes tooth pulp nerve endings, providing short-term relief by blocking pain signals. BioMin® toothpaste containing bioactive glass with fluoride works by bonding to teeth and optimally occluding the dentinal tubules with its fluoro calcium phosphosilicate bioactive glass, providing sustained and long-term relief from DH.³⁹ Experts advise a sequential approach: potassium nitrate for immediate relief, followed by BioMin® for long-term occlusion over 4-12 weeks. Alternatively, some recommend starting directly with BioMin® for immediate relief.

Desensitising toothpaste should be used for 4-12 weeks, with follow-up for reinforcement before switching to regular toothpaste. Abrasive whitening toothpaste should be avoided as it may worsen sensitivity. All desensitising approaches must prioritize operative management of any outstanding dental care needed.

Place of BioMin® in the management of dentine hypersensitivity

Literature evidence

BioMin® is a bioactive glass containing fluoride that bonds with enamel and releases calcium, phosphate and fluoride ions, leading to the formation of more acid-resistant fluorapatite than hydroxycarbonate apatite.^{14,40,41} A 'smart' effect has also been observed, with BioMin® particles dissolving more rapidly at lower pH to restore

the equilibrium and kick-start the remineralization process.^{39,42,43}

With particle size half of calcium sodium phosphosilicate (CSPS) it provides deeper penetration and optimal occlusion of dentinal tubules.⁴⁴ It gradually releases therapeutic levels of calcium, phosphate and fluoride ions (530 ppm of fluoride) over 12 hours, facilitating fluorapatite formation.

Studies show that BioMin® maintains therapeutic fluoride levels for up to 24 hours with twice-daily use, regardless of brushing technique effectiveness. This comprehensive action makes BioMin® an effective agent for managing DH and promoting oral health.³⁹ Several studies indicate the superiority of BioMin® over other desensitizing agents in the management of DH (Table 1).

Table 1: Summary of clinical trials.

Trial	N	Inclusion criteria	Intervention	Key results
Patel et al³⁷	75	Gingival index score ≤ 2 . Without dental problems or active periodontitis apart from experiencing DH. With cervical abrasion, abfraction or gingival recession.	Toothpaste containing BioMin® (FCPS) vs 8% Arginine and Calcium Carbonate vs Placebo.	FCPS group had a superior reduction in DH and improved VAS (for evaporative stimuli), plaque and gingival index
Hussain et al⁴⁵	60	VAS score of ≥ 4 to both subjective and thermal stimuli in at least two teeth	Dentifrice containing BioMin® (FCPS) vs 5% CSPS vs Fluoride.	FCPS was most effective in reducing the VAS score (subjective and thermal sensitivity), followed by CSPS and fluoride.
Reddy et al⁴⁶	160	At least two sensitive permanent tooth surfaces (buccal/facial aspects of incisors, canines or premolars)	Toothpaste containing BioMin® (FCPS) vs CSPS vs Herbal toothpaste vs 5% potassium nitrate	FCPS
Aggarwal et al⁴⁷	93	Clinical presentation of DH with good general and oral health	Dentifrice containing BioMin® (FCPS) vs CSPS vs strontium chloride hexahydrate	At week 2, FCPS group showed more significant reduction in VAS and VRS, compared to other groups, indicating early response. At week 4, similar improvement in subjective assessment and QOL.

CSPS, Calcium Sodium Phosphosilicate; DH, Dentin Hypersensitivity; FCPS, Fluorocalcium Phosphosilicate; QOL, Quality of Life; SCASS, Sensitivity Clinical Assessment Score; VAS, Visual Analog Scale; VRC, Verbal Rating Scale.

Expert opinion

BioMin® contains 3 times more phosphate concentration compared to CSPS containing toothpastes and, BioMin® initiates the formation of fluorapatite with 6 hours in buffer and 45 mins in artificial saliva.^{41,43,44}

BioMin® is an advanced bioactive glass highly resistant to acid attack and designed to enhance dental health by formation of fluorapatite. It reduces DH by blocking fluid flow through dentinal tubules and strengthens teeth by aiding remineralisation. It has a low Relative Dentine Abrasivity (RDA) of 68.

BioMin's® FDA approval and lower sustained-release fluoride content compared to other agents improve patient tolerability. Guidance stress on "spit but no-rinse" application to optimise results. Combining BioMin® with other desensitisers like potassium nitrate may reduce efficacy due to interference with ion penetration. Current evidence does not support their concurrent use, but

BioMin® remains a promising option for improving oral health and quality of life outcomes in DH management.

Tailored treatment approach

Literature evidence

To effectively manage DH, a comprehensive approach is necessary, involving patient education, non-invasive treatments like desensitising toothpaste and potentially restorative interventions based on severity.⁴⁵ Patient education focuses on modifying behaviours such as toothbrushing techniques, dietary adjustments and addressing parafunctional habits like bruxism.⁴⁵ Desensitising toothpastes containing potassium salts, strontium salts, bioactive glasses and fluorides are recommended as a part of initial treatments, providing both immediate and sustained relief by either desensitising the dentine-pulp complex or occluding the dentinal tubules.^{14,35,45} Improper tooth brushing practices, including using hard or thick-bristle brushes, brushing with excessive pressure or neglecting the cervical areas,

can contribute to DH. To mitigate this, patients should use desensitising toothpaste with a soft-bristle toothbrush and minimise water usage to avoid diluting the active ingredients.^{14,46}

Restorative interventions are indicated for cases with significant structural loss, ensuring long-term occlusion of exposed dentinal tubules.⁴⁰ The decision to proceed with restorative treatments is guided by tooth wear assessment and patient preferences.⁴⁷

Expert opinion

Experts emphasize that tailored management strategies (Figure 3), which address individual patient needs with evidence-based interventions, aim to alleviate symptoms and improve quality of life.

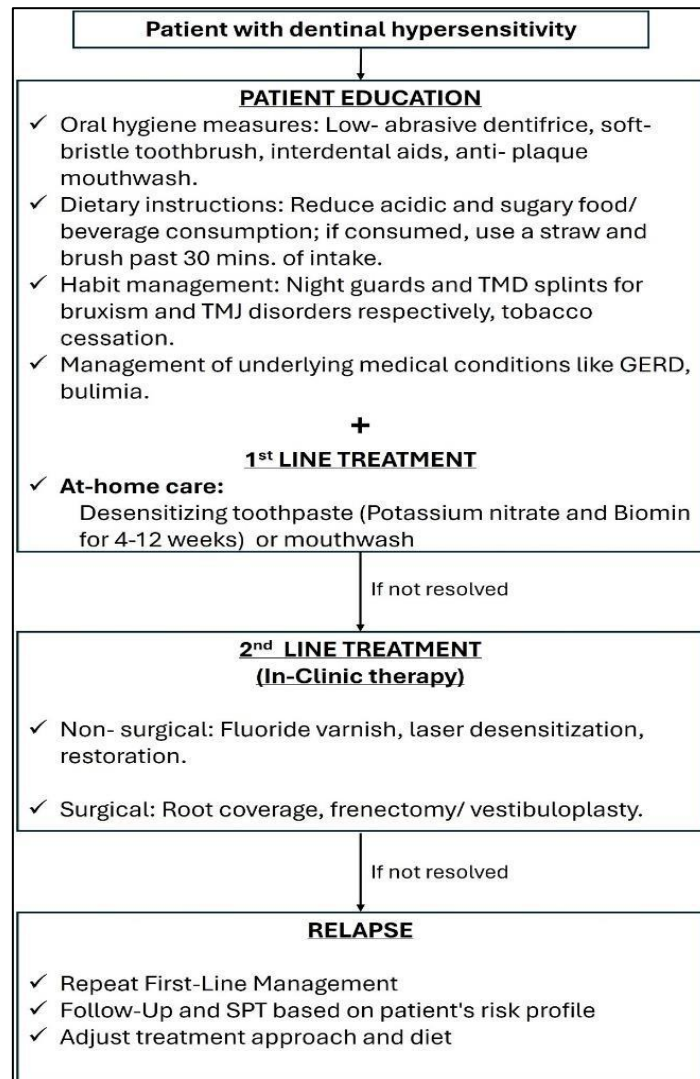


Figure 3: Proposed management algorithm for dentinal hypersensitivity.

Patient education

Includes understanding the condition and contributing factors like oral hygiene maintenance techniques and diet. Recommended practices include using low-abrasive toothpaste, soft-bristled brushes, interdental aids and antiplaque mouthwashes. Limiting acidic/sugary foods, using a straw for erosive drinks and waiting at least 30 minutes before brushing after consuming acidic foods is crucial.

Habit management

Patients with parafunctional habits like bruxism or temporomandibular disorders (TMD) may benefit from a Michigan splint/soft splint/night guard or TMD splint respectively. Patients with tobacco or betel nut use should be directed to cessation programs. Collaborating with healthcare providers for systemic conditions like GERD or bulimia is essential.

At-home care

Desensitizing toothpastes and mouthwashes play an important role in the first line of management by either desensitising the nerves or blocking the dentinal tubules.

Chairside interventions

Non-surgical/non-invasive procedures like application of fluoride varnish or laser desensitisation and minimally invasive restorative procedures like glass ionomer cement or composite restorations, serve as second-line options.

Surgical interventions

Root coverage for non-restorable abrasions, gingival recession and corrective procedures like frenectomy or vestibuloplasty; tailor management based on individual needs.

Management of Patients with Relapse of dentine hypersensitivity

Literature evidence

Relapse can occur due to discontinuation of desensitising treatments, such as toothpastes, lack of diet and habit modification by patients like continuation of aggressive brushing, intake of acidic/sugary food substances.¹³ Long-term management necessitates ongoing treatment adjustment and regular monitoring, tailored to individual

cases. For persistent symptoms despite initial treatment, consider switching or supplementing with different desensitising agents or adjusting from at-home to in-office management. Once symptoms resolve, promote ongoing dental hygiene and behavior modification for sustained outcomes.³⁵

Expert opinion

Experts recommended a consistent, management protocol for DH. Relapse may indicate an unaddressed aetiology, insufficient patient motivation or failure to correct contributing factors. The primary action should be to identify and eliminate the root cause of DH. Follow-up appointments should align with the patient's risk profile, integrating supportive periodontal therapy (SPT) and dentists must reinforce proper brushing techniques and dietary adjustments.

RECOMMENDATIONS FOR FUTURE RESEARCH/FUTURE ROADMAP

Standardised clinical definitions, education and screening protocols are essential for accurate and timely diagnosis. Integrating desensitising agents for at-home care with specialized therapies can improve patient outcomes through guideline development and evidence-based practices.³⁵ Emphasize on newer biomaterials and innovative technologies (lasers and nanotechnology). We propose long-term Indian studies and exploration of BioMin's® anti-plaque and anti-gingivitis properties for oral hygiene maintenance.

Table 2: Summary of literature evidence and expert opinion.

Section	Literature evidence	Expert opinion
Incidence and prevalence	DH affects 33.5% of adults, with higher self-reported rates. Caused by enamel wear and dentin exposure, often linked to periodontal disease. Most common in ages 20-50, peaking at 30-40 and less common in older adults. Slightly more prevalent in females and may increase in colder months.	DH is caused by faulty oral hygiene, plaque acids, poor diet, bruxism and conditions like GERD. Common in ages 40-60; less in those over 60 due to secondary dentin. Slightly more in females; reasons unclear. Seasonal changes from warm to cold or increased consumption of cold beverages in warm conditions may worsen symptoms.
Patient journey	Pain disrupts QOL, leading patients towards OTC products which in turn may mask underlying cause. Post procedural sensitivity often resolves in 2-4 weeks; chronic issues may persist.	Mild to moderate DH often goes unnoticed until significant discomfort prompts OTC use. Patient evolves through stages of avoidance, adaptation and compromise. Delay in professional care can worsen issues and increase workload. Self-prescribed OTC products may provide only temporary or no relief with a relapse in 2-4 weeks post discontinuation.
Diagnosis	Diagnosis involves patient history, clinical examination and exposure to stimuli (thermal, evaporative, mechanical, chemical). Tools like electrical pulp testers, radiography and percussion confirm DH. VRS and VAS measure pain intensity.	Diagnostic challenges include fluctuating and overlapping symptoms. Establishing DOE (Diagnosis of Exclusion) for caries, pulpitis and cracked tooth syndrome is the right approach. Effective diagnostic tools include patient history, thermal/ mechanical tests with rubber dam isolation and assessment with VAS, VRS, Schiff Scale and radiographic imaging.
Different factors while	Accurate diagnosis involves understanding etiopathogenesis, saliva composition,	Potassium nitrate is recommended for immediate and short-term relief from DH and BioMin® for longer

Continued.

Section	Literature evidence	Expert opinion
considering a desensitizing agent	plaque and tooth morphology. Desensitizing toothpaste is effective after about four weeks; longer use leads to better symptom reduction.	and sustained action. Desensitizing toothpaste is usually recommended for 4-12 weeks followed by re-evaluation; avoid abrasive whitening products.
Place of BioMin® in management of DH	BioMin® is a fluoride-containing bioactive glass that forms more acid-resistant fluorapatite. Releases calcium, phosphate and fluoride ions for blockage of dentinal tubules and remineralization. With a particle size half of CSPS, it provides deeper penetration and optimal occlusion of dentinal tubules. Maintains fluoride levels for 24 hours with twice-daily use.	BioMin® is a SMART bioactive glass that dissolves faster in acidic pH to release calcium, phosphate and fluoride ions and initiates the formation of more acid-resistant fluorapatite within 6 hours in buffer and 45 min in artificial saliva. Has low RDA value of 68, is FDA-approved and is well-tolerated. Regarded as "a therapy" and not just a toothpaste for DH. Spit but no rinse technique is recommended to enhance contact time and efficacy.
Tailored	Comprehensive management includes patient education on brushing, diet and habits.	Customise treatments based on individual needs. Educate and motivate patients on oral hygiene maintenance instructions like soft bristle toothbrush, brushing technique, interdental aids and anti-plaque mouthwash. Address habits like bruxism with a night guard, TMD with splints and cessation of tobacco/betel nut use and manage systemic conditions like GERD.
treatment approach	Initial treatments involve brushing with a soft-bristle brush and desensitising toothpastes containing potassium or fluoride. Restorative interventions with GIC or composite are taken into consideration where significant loss of tooth structure is noted.	First line management with desensitising toothpaste/mouthwash, second line with fluoride varnish, laser desensitisation. Consider restorative or surgical procedures like root coverage for better resolution.
Management of patients with relapse of DH	Relapse can occur after stopping desensitising treatments due to failure of habit and diet modification. Management requires ongoing adjustments, regular monitoring and potential treatment changes.	Maintain a consistent approach. Relapse may indicate unaddressed causes, low motivation or unresolved issues. Identify and eliminate root causes; tailor follow-ups to risk profile, including supportive periodontal therapy; reiterate oral hygiene instructions and dietary adjustments; reinstate first line of management protocol.

CSPS, Calcium Sodium Phosphosilicate; DH, Dentin Hypersensitivity; GERD, Gastroesophageal reflux disease; OTC, Over The Counter; QOL, Quality of life; RDA, Relative Dentin Abrasivity; TMD, Temporomandibular disorders; VAS, Visual Analog Scale; VRS, Verbal Rating Scale.

CONCLUSION

DH is a significant global oral health challenge impacting daily life and patient well-being. This expert opinion document highlights the epidemiology, risk factors, screening, diagnostic tools and evidence-based interventions for DH. BioMin® shows promise in managing DH with its unique remineralising properties, optimal occlusion of dentinal tubules and superior clinical efficacy compared to traditional desensitising agents. The viewpoints compiled are tailored to cultural context of the expert practice domains and may not be readily applicable across the world that employ significantly distinct methods of providing dental care to patients.

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