

Review Article

Systematic Literature Review on Burning Feet Syndrome

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Introduction

Burning Feet Syndrome (BFS), also known as Grierson-Gopalan Syndrome, is a neurological condition characterized by sensations of burning, warmth, tingling, or pain in the feet, which often intensify at night. While BFS may be idiopathic, it is frequently secondary to systemic conditions such as diabetes mellitus, hypothyroidism, or nutritional deficiencies [1]. Despite its clinical relevance, BFS remains underdiagnosed and poorly understood, with limited awareness among healthcare professionals and patients alike. This review aims to systematically evaluate the literature on BFS, offering a scoping overview of its etiology, diagnostic approaches, treatment modalities and existing research gaps.

Methods

This review adheres to the PRISMA 2020 guidelines for systematic reviews [2]. Peer-reviewed sources were selected from databases including RACGP, Europe PMC [3] and the World Journal of Pharmaceutical Research. The inclusion criteria encompassed studies addressing idiopathic and secondary BFS, as well as clinical trials, observational studies, literature reviews published in English. Exclusion criteria included case reports lacking diagnostic confirmation and non-peer-reviewed sources. The PRISMA-ScR extension guided the scoping methodology to ensure comprehensive mapping of the literature.

Results

Aetiology and Pathophysiology

BFS has a multifactorial aetiology:

- Peripheral neuropathy is the most prevalent cause, particularly in individuals with diabetes mellitus and chronic alcoholism [1].

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- Vitamin B-complex deficiencies, including thiamine (B1), pyridoxine (B6), cobalamin (B12) and riboflavin, have been implicated in the pathogenesis of BFS due to their role in nerve function.
- Endocrine disorders, such as hypothyroidism and diabetes, contribute to neuropathic symptoms and may exacerbate BFS [4].
- Mechanical compression syndromes, such as tarsal tunnel syndrome and psychosomatic factors are also recognized contributors.
- Idiopathic cases present without identifiable causes, even after extensive diagnostic evaluation.

Diagnosis

Diagnosis of BFS is primarily clinical, supported by targeted investigations:

- Clinical features include burning, tingling, heaviness and pain in the feet, typically worsening at night.
- Laboratory tests assess glucose levels, thyroid function, vitamin B-complex status and uric acid levels.
- Electrophysiological studies, including nerve conduction studies and Electromyography (EMG), help identify neuropathic patterns.
- Skin biopsy may be used to evaluate small fiber neuropathy.
- Psychiatric evaluation is recommended in idiopathic cases to assess for underlying psychosomatic contributions.

Treatment

Management of BFS involves both general and disease-specific strategies:

- General measures include cold water foot soaks, use of comfortable footwear and avoidance of heat exposure.
- Pharmacologic treatments encompass gabapentin, pregabalin, amitriptyline, topical capsaicin, lidocaine patches and vitamin supplementation [3].
- Disease-specific treatments target underlying conditions: allopurinol for hyperuricemia, insulin or oral hypoglycemics for diabetes and thyroid hormone replacement for hypothyroidism [4].

Scoping Review

Scope and Objectives

The objective of this scoping review is to map the breadth of existing literature on BFS, identify knowledge gaps and inform future research directions. The framework is based on PRISMA-ScR methodology, emphasizing transparency and reproducibility in literature synthesis.

Literature Landscape

The current literature on BFS is limited in scope and quality:

- Most studies are anecdotal or small-scale observational reports.
- There is a geographic bias, with a significant proportion of studies originating from Asia and the Far East.
- BFS is often dismissed as vague or psychosomatic, leading to underreporting and misdiagnosis.

Updated Literature Insights (2023–2025)

Aetiology and Pathophysiology

Recent case studies continue to emphasize small fiber neuropathy (SFN) as a key contributor to BFS. A 2025 case report in the Australian Journal of General Practice described a 71-year-old male with bilateral burning feet, diagnosed with SFN based on impaired temperature sensation and preserved proprioception. This reinforces the role of A δ and C fibres in the pathogenesis of BFS [5]. Additionally, a 2024 narrative review on erythromelalgia, a condition with overlapping symptoms, explored procedural interventions such as sympathetic ganglion blocks and spinal cord stimulation, suggesting potential therapeutic parallels for BFS [6].

Diagnosis

The RACGP case study also highlighted the importance of targeted neurological exams, including temperature and pinprick sensation testing, to differentiate SFN from large fiber neuropathies. This aligns with emerging diagnostic protocols that prioritize clinical pattern recognition and skin biopsy for detecting small fibre involvement [5].

Treatment

A 2025 WebMD review emphasized multimodal treatment approaches, including:

- Topical agents (capsaicin, lidocaine)
- Oral medications (gabapentin, pregabalin)
- Lifestyle modifications (foot soaks, breathable footwear)
- Management of underlying conditions like diabetes and hypothyroidism [7].
- The Cleveland Clinic also updated its guidance to include psychosomatic evaluation and nutritional correction, particularly for vitamin B deficiencies [8].

Genetic and Molecular Insights

A 2023 article from Footora explored the genetic basis of BFS, linking it to mutations affecting nerve transmission and highlighting the need for genetic testing in idiopathic cases. This supports the inclusion of genomic screening in future diagnostic protocols [9].

Scoping Review Updates

Recent literature continues to reflect:

- Sparse high-quality trials, with most evidence still anecdotal or observational [10].
- Geographic bias, with newer studies emerging from Australia and the U.S.
- Growing interest in procedural interventions, such as transcranial magnetic stimulation and botulinum toxin injections, though evidence remains limited [6].

Identified Gaps

Key gaps in the literature include:

- Absence of large-scale epidemiological studies to determine prevalence and risk factors.
- Lack of standardized diagnostic criteria, resulting in inconsistent clinical recognition.
- Limited randomized controlled trials (RCTs) evaluating treatment efficacy.
- Poor understanding of genetic and molecular mechanisms underlying BFS.

Research Priorities

Future research should focus on:

- Developing standardized diagnostic protocols to improve clinical recognition.
- Investigating genetic predisposition and identifying potential biomarkers.
- Conducting RCTs to evaluate both pharmacologic and non-pharmacologic interventions.
- Exploring psychosomatic and neuroinflammatory pathways to understand idiopathic cases better.

Conclusion

Burning Feet Syndrome (BFS), also known as Grierson-Gopalan Syndrome, remains a clinically significant yet underrecognized condition with a multifactorial aetiology. The syndrome is most associated with peripheral neuropathy, particularly in the context of diabetes and chronic alcoholism [1]. Recent studies have expanded our understanding by highlighting the role of small fiber neuropathy (SFN), involving A δ and C fibers, as a key contributor to the burning sensation experienced by patients [5]. Emerging evidence also suggests that genetic mutations affecting nerve transmission may be a potential cause in idiopathic cases, highlighting the need for genomic screening in unexplained presentations (Footora, 2023). Diagnostic advancements now emphasize targeted neurological examinations and skin biopsies, which are more sensitive in detecting SFN compared to traditional nerve conduction studies [5].

Treatment strategies have evolved to include multimodal approaches, combining pharmacologic agents such as gabapentin and pregabalin with topical therapies like capsaicin and lidocaine [7]. Additionally, lifestyle modifications and psychosomatic evaluations are increasingly recognized as essential components of comprehensive care (Best Foot Forward, 2024). Disease-specific management, including vitamin supplementation and endocrine correction, remains a foundational approach.

Despite these advances, significant gaps persist. There is a lack of standardized diagnostic criteria, limited randomized controlled trials and insufficient understanding of the molecular mechanisms underlying BFS [2]. Geographic bias in research and the tendency to dismiss BFS as psychosomatic further hinder progress [4]. To address these challenges, future research must prioritize the development of standardized diagnostic protocols, the exploration of genetic

and neuroinflammatory pathways and the rigorous evaluation of both pharmacological and non-pharmacological interventions. A multidisciplinary approach, involving neurology, endocrinology, psychiatry, and podiatry, is essential for improving diagnosis, treatment and patient outcomes.

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