

# A Review of Geographic Tongue Journey: From Diagnosis to Therapeutic Considerations

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## ABSTRACT

Geographic Tongue (GT) affects the mucous membrane of the tongue and is a non cancerous condition that causes smooth, reddish regions resemble maps. Despite its widespread incidence, the cause of GT is still unknown; it has been linked to allergies, asthma and psychological stress. A thorough literature evaluation synthesises information about the visual and sensory features of GT, such as atrophic mucosa, serpiginous white regions and dynamic lesion migration, using reliable databases. Hormonal causes, psychological stress, parafunctional behaviours and possibly hereditary predispositions are all contributing factors. Genetic insights that disclose mutations in IL36RN and variances in human leukocyte antigens highlight the significance of immunological markers. Clinical features are used to diagnose and a thorough examination is required to differentiate GT from similar lesions. Although biopsies are not always required, they can validate clinical diagnoses. Management focuses on assurance because GT is a self-resolving condition, with each symptomatic case handled separately. There isn't a single, widely acknowledged gold standard for treatment; alternatives include topical anaesthetics, corticosteroids, anxiolytics and antihistamines. The review was kept coherent and with considerable depth in its coverage of GT, including its clinical features, visual and sensory characteristics, contributing factors including genetic and immunological markers, diagnostic criteria and management strategies.

**Keywords:** Antihistamines, Anxiolytics, Atrophic mucosa, Genetic markers

## INTRODUCTION

Patches of smooth, reddish skin appear on the tongue due to a non cancerous disorder known as GT. GT does not spread because it is benign. The reason it's named GT is that the patch patterns mimic the representation of landmasses and oceans on maps [1]. Rayer's initial description from 1831 highlighted this condition [2]. It is a condition of the tongue's mucous membrane, typically found on its dorsal side [3]. It is a prevalent ailment that impacts roughly 2-3% of the population [4,5]. The name of the tongue originates from its map-like appearance, where its patches resemble the islands in an archipelago [2,6]. There is no known origin for the condition, but it is completely benign and does not indicate oral cancer [7]. Moreover, there is currently no treatment that can cure it. An unusual side effect of GT is burning tongue sensation [8]. Patients with allergy, asthma, rhinitis and psoriasis diseases stated that they have been more frequently, suffering from GT, which points to the association between these systemic diseases and GT appearance [6,7]. There is a possibility that the observed association in the current study can be explained by immune system dysregulation [4]. Precarious situations, such as asthma and allergies, are linked with increased immune stimulus and are, therefore, associated with the inflammatory changes that occur in GT [5].

Likewise, psoriasis, an autoimmune condition, results in inflammation and skin barrier dysfunction, which could affect mucous membranes such as the tongue [1,6]. Systemic inflammation might be present in these conditions and initiate similar reactions in the oral cavity, resulting in GT manifestation [5].

Other systemic diseases, including diabetes and gastrointestinal diseases that alter health and mucosal barrier, may predispose them to GT [6-8]. For instance, the condition of diabetes affects the primary secretion, saliva volume and pH may predispose individuals to oral lesions [3]. Changes in the gastrointestinal tract might lead to deficiencies; for example, vitamin B2 has been known to be associated with GT and other oral conditions [8,9].

Several factors, such as psychological and psychiatric conditions, have been shown to worsen such conditions and stress as well. Stress has been suggested to encode immune reaction and inflammatory processes, which thoughts put the GT into a worse state or even cause a GT episode [7]. Taken together, the above data and findings indicate that GT has a positive correlation with those systemic conditions and how the immune function and inflammation, as well as psychosocial factors, interact, is not fully understood and deserves further research [7,9].

Additional research involving a larger cohort is required to ascertain whether GT is an oral manifestation of a systemic disease [10]. Patients with GT frequently report oral candidiasis and caries [11]. However, this might be explained by saliva that has a lower pH, which can accelerate the cariogenic process [12]. Overall, the present thorough review effectively navigates the complexity of GT and provides researchers and physicians with a helpful tool.

## DISCUSSION

Iron-deficiency anaemia and celiac disease are highly prevalent among GT patients [13,14]. The lateral border of the tongue is where GT is most frequently observed, followed by the anterior dorsum and ventral surface of the tongue [15,16]. Over time, the problem might go away, but it's hard to say if or when that will happen [17].

### Visual and Sensory Characteristics of Geographic Tongue (GT)

**Unravelling the texture of the tongue:** Under normal circumstances, the tongue's dorsal surface is covered in tuft-like projections known as lingual papillae, some of which are connected to taste buds [18,19]. This uneven surface texture and white-pink tint give the tongue its characteristic appearance [20]. Areas of atrophy and depapillation (loss of papillae) in GT are distinguished from unaffected areas by their smoother and erythematous (darker red) surfaces [21]. The depapillated sections are typically clearly defined, with a slightly elevated serpiginous (snaking) outer zone that is white, yellow, or

gray [22,23]. Before depapillation, a GT lesion may first appear as a white area [24]. Lesions usually arise in many spots on the tongue and eventually combine to form the characteristic map-like look [25,26]. However, this is not always the case. Usually, within hours, the lesions migrate to other locations and alter in size and shape [27,28].

**Variations in Geographic Tongue (GT) features:** The tongue's dorsal surface of the tongue may be affected entirely at times, or just a portion of it, with the tongue's tip and sides being most commonly affected areas [29,30]. There are times when the illness is in remission and times when it recurs. It is believed that times of mucosal healing are indicated by the loss of the white peripheral zone [31,32]. In fact, other than the atypical appearance of the tongue, there is normally no sign or symptom; however, in some circumstances, which include having hot, acidic, spicy foods, the patient experiences pain and burning sensations [33]. Other reasons for burning feeling on the tongue, such as oral candidiasis, are taken into consideration when there is a burning symptom [34].

## Exploring Contributing Factors to Geographic Tongue (GT)

One of the contributing factors of GT may be an oral parafunctional habits [17]. People who have parafunctional tongue habits may have crenated tongue or scalloping on the sides of the tongue [5,6]. Use of oral contraceptives some speculate that hormonal considerations may be a cause factor for GT [21,24]. People who suffer from GT often report that psychological stress make their condition worse [25]. Tobacco use and smoking have an inverse relationship with GT [26]. GT is sometimes claimed to run in families and is linked to multiple genes [14]. However, research indicates that comparable foods may also play a role in the family association [1,22].

**Impact of genetic factors and immunological markers on Geographic Tongue (GT):** Mutations in IL36RN gene cause certain cases of GT [27]. GT in cases without such mutations, there is an imbalance in the expression of the IL-36Ra and IL-36γ proteins in the tongue tissue [27]. The causes of GT and potential associations are represented in the [Table/Fig-1] [6,17,25,27,28].

Factor	Description
IL36RN mutations	Certain cases of GT are linked to mutations in the IL36RN gene, suggesting involvement in the immune system pathway [27]
IL-36Ra & IL-36γ imbalance	In GT cases without IL36RN mutations, an imbalance in the expression of these proteins in the tongue tissue is observed [27]
Human Leukocyte Antigens (HLA)	Specific HLA types like B51, DR5, DRW6 and Cw6 have been associated with increased or decreased GT susceptibility [6,25]
Vitamin B2 deficiency (Ariboflavinosis)	This deficiency can manifest in oral symptoms, potentially including GT [17]
Fissured tongue	Often co-exists with GT, with some considering it a possible advanced stage [28]
Psoriasis	A correlation between psoriasis and GT is often highlighted, even though 90% of kids with GT diagnosis do not develop psoriasis [6]. Correlation is often mentioned, but recent studies find no significant connection between GT and psoriasis in most cases [6,25]

**[Table/Fig-1]:** Genetic factors and immunological markers responsible for GT [6,17,25,27,28].

## Diagnosis of Geographic Tongue (GT)

Clinical and intraoral features are the primary basis for the diagnosis of GT. A meticulous examination can establish a differential diagnosis between GT and oral candidiasis, two illnesses that appear identical [23]. GT is a type of keratotic lesion that resembles a white plaque with an uneven or circular shape [29]. It is usually self-resolving and cannot be removed by scraping. It is known that these lesions can regenerate across a range of time.

The normal clinical examination reveals that GT should be diagnosed through systematic clinical examination along with other methods, like laboratory diagnosis. The typical lesions include somewhat

raised, ill-demarcated eroded salmon-red macules with smooth, slightly raised surfaces that are frequently surrounded by sharply defined, proximal white rims on the tongue [23]. The characteristic skin lesions are migratory, as is typical of the disease in question. The differential diagnosis includes anaemia, the condition that causes a pale smooth surface and is detectable by blood tests, or other nutritional deficiencies that manifest as glossitis [11]. For instance, if atrophic glossitis is expected, a reduction in vitamins and iron, such as vitamin B12, will show whether the problem originates from a systemic cause [19]. While GT never requires a biopsy usually, it may be needed if the lesions seem suspicious or if there are doubts about malignancy [26,30]. Microscopic examination may show changes in the tissue that may mimic other diseases, including psoriasis [26,29]. This aids in the confirmation of the diagnosis and give clues as to the characteristic of the lesions [29]. In cases of GT, cytological features such as Ying-yang nucleus and inflammatory changes can be identified [2,3]. This may also help in the differential of GT from other similar diseases, to provide another level of confirmatory factor [2,28].

**Intraoral conditions associated with GT:** A higher prevalence of GT in patients with Burning Mouth Syndrome (BMS) is observed suggesting a possible link between the two conditions due to shared underlying causes like inflammation and altered immune response, both of which have similar anatomical appearances [31]. Individuals with GT may have a higher incidence of oral candidiasis, likely due to altered mucosal barrier function, as fungal infections can occur more frequently in areas affected by GT [10,32]. GT and oral lichen planus, a possible shared pathophysiological mechanism is observed among these two conditions [1,5].

**Extraoral conditions associated with GT:** In some of the earlier research done, it has been concluded that individuals who suffer from GT are prone to food allergies [22]. Anaphylactic reactions, including modifications such as inflammation and mucosal changes, can fertilise the formation of GT lesions. Patients with GT may experience worsening symptoms when taking certain foods, especially common food allergens (e.g., oranges, chili) [10,22]. Since a connection between food allergies and GT has been identified, caregivers may wish to screen individuals with GT for food allergies if the latter complain of symptoms associated with specific foods [3,22].

People with GT may develop vitamin B12 deficiency more frequently; numerous patients with GT have demonstrated the signs of PN, including the deficiency of B vitamins, including B12 [6,13]. Oral manifestations of vitamin B12 depletion include glossitis and the clinical presentation may mimic GT. These situations make it rather difficult to differentiate between the two conditions based on clinical presentation [33]. This relationship may be partly due to the fact that vitamin B12 is involved in the maintenance of the epithelial tissues affected by GT [3,5,33]. These changes can lead to atrophy or inflammation of the mucosal surface of the tongue, which are hallmarks of GT; vitamin B12 may help correct these deficiencies and prevent GT manifestations in related patients [10,33].

## Management of Geographic Tongue (GT)

Although GT is known to be a non malignant condition, the symptoms that accost patients, especially discomfort, can be disheartening. The first thing to do in the management of GT is therefore to reassure them. Patient should be informed of benign nature of this condition and they should be told that it does not cause severe health problems [2,3]. Acknowledging the fact that GT is not constantly stable and may eventually decline on its own will be quite comforting to most people [7].

Lifestyle changes, particularly the selection of the right diet, can go a long way in controlling the symptoms [3]. Diet with adequate nutrients keeps several oral health conditions at bay [33].

In patients with discomfort, some measures of symptomatic therapy can be used. Outright medicaments like lidocaine can make the

pain or burning sensation temporarily disappear [4,22]. A topical application of the corticosteroids like triamcinolone acetonide can help to relieve any inflammation and the resulting discomforts noted [30]. Herbs like aloe vera or chamomile are believed to soothe the stomach lining [2,30]. Thus, the management of GT comprises of counselling, diet, modifying agents, symptomatic relief, referrals to other therapies and follow-up [1,22]. A comprehensive treatment strategy that considers the disease's pathophysiology and patient characteristics will enable patients to manage this innocuous but often uncomfortable disease.

## CONCLUSION(S)

The GT is a unique and benign mucous membrane ailment of the tongue that affects a significant section of the population. It is distinguished by a map-like appearance. Although common, the precise aetiology of GT is still unknown; nevertheless, allergies, asthma and psychological stress have all been linked to the condition. A thorough assessment of the clinical and intraoral characteristics is necessary for the diagnosis and differential diagnoses, such as oral lichen planus, must be taken into account. The article's conclusion emphasises the necessity of conducting more extensive research to provide firm treatment recommendations for GT, recognising the difficulty in treating this unusual and sometimes asymptomatic oral illness.

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### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. NA

### PLAGIARISM CHECKING METHODS:

- Plagiarism X-checker: Jun 08, 2024
- Manual Googling: Nov 02, 2024
- iTenticate Software: Nov 04, 2024 (7%)

### ETYMOLOGY:

Author Origin

### EMENDATIONS:

6

Date of Submission: **Jun 07, 2024**

Date of Peer Review: **Jul 11, 2024**

Date of Acceptance: **Nov 06, 2024**

Date of Publishing: **Mar 01, 2025**