

Salivary cortisol levels in patients with geographic tongue and its relationship with anxiety

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Abstract

Background and Aim: Benign migratory glossitis, or geographic tongue, is usually an asymptomatic inflammatory disorder of unknown etiology that affects the epithelium of the tongue. Among the etiologic factors proposed, emotional causes were suspected by several investigators. The objective of this study was to evaluate the anxiety and cortisol level in patients with geographic tongue compared with healthy controls.

Materials and Methods: In this case-control study, 21 patients with geographic tongue referred to several educational and medical centers in Hamedan city were selected. The patients had no systemic disease or history of cigarette smoking. A control group of 21 healthy individuals without geographic tongue, systemic diseases and cigarette smoking was also selected. The participants were asked to complete the Beck Anxiety Inventory. Also, unstimulated saliva samples were collected to measure the salivary cortisol level in both groups. The two groups were compared after adjusting for age and gender. The Mann-Whitney test was used to compare the salivary level of cortisol in the two groups with and without geographic tongue.

Results: The anxiety score of the geographic tongue group was higher but not significantly ($P=0.745$). The concentration of salivary cortisol was significantly higher in the control group ($P=0.01$). No strong correlation was found between the salivary cortisol level and the Beck Anxiety Inventory score.

Conclusion: It seems that among the various factors associated with geographic tongue, psychological conditions are less related.

Key Words: Geographic Tongue and Fissured Tongue; Anxiety; Hydrocortisone; Saliva

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Introduction

Geographic tongue is a common inflammatory condition that can affect different parts of the tongue, and is most commonly found on the dorsal surface of the tongue. The common feature of this condition is erythematous patches as a result of atrophy of the filiform papillae, which sometimes have a white peripheral margin (1, 2). Its prevalence varies in different geographical areas (3). The prevalence of geographic tongue in studies varies from 0.5% to 17.2% (4, 5). Its prevalence rate in Iran is 3.6% (6). Some studies suggest a possible correlation between geographic tongue and psoriasis (7), nutritional diseases (8), psychological conditions (2), genetic factors (9), and fissured tongue (10). Some researchers have also suggested immunological and psychological contexts for the geographic tongue (11, 12). The etiology of geographic tongue remains unknown, but some patients have shown lesions associated with emotional factors (12). It seems that the pathogenesis of geographic tongue is related to epithelial turnover (desquamation and keratinization processes) (13).

Saliva is a secretory fluid which contains 99% water (14). The remaining 1% includes electrolytes, proteins, immunoglobulins, antimicrobial agents, and mucosal glycoproteins (15, 16). Saliva can be used as a useful and non-invasive alternative to serum and plasma to assess the stress response (17, 18). Stress and anxiety are the most common mental illnesses. These diseases cause physical and pathological changes in the body, and the oral cavity is no exception (19). Anxiety disorders are a diverse range of psychiatric conditions with alarming clinical symptoms, fear, or panic attack that may occur for no reason or due to specific causes (such as physical danger or public speaking). Somatization refers to a phenomenon in which patients express their feelings through complaints and physical discomfort (20). The prevalence of depression and anxiety disorder is higher in patients with multiple somatic symptoms that cannot be explained medically. Salivary cortisol level can reliably indicate hypothalamus-pituitary-adrenal pathway activity and is considered as a biological identifier in psychological studies (21). Considering the various causes of occurrence and recurrence of geographic tongue, the

purpose of this study was to investigate the relationship between salivary cortisol level and occurrence of geographic tongue in patients with anxiety.

Materials and Methods

This case-control study was conducted on all patients referred to medical centers in Hamadan city, Iran during the research period. The study was approved by the ethics committee of Ibn Sina University of Medical Sciences, Hamadan, Iran (IR.UMSHA.REC.1397.216).

The Beck Anxiety Inventory is a self-reported questionnaire designed to measure the severity of anxiety in adolescents and adults (22). Studies show that this questionnaire has high validity and reliability (23-25). The participants were selected by convenience sampling. The case group included patients with geographic tongue and the control group included healthy controls without geographic tongue and no history of it. The exclusion criteria were patients with uncontrolled systemic diseases, Reiter's disease, psoriasis, neurological diseases, chronic anxiety, corticosteroid intake, history of recent stress, such as loss of family members or physical trauma such as accidents, smoking, oral ulcers, autoimmune diseases, and asthma. Clinical examination was performed to detect geographic tongue in the two study groups. The clinical diagnostic criterion was presence of erythematous patches, which usually have a white peripheral margin. Each case was approved by an oral disease specialist. The control group was selected from those who did not have geographic tongue and also did not have any of the exclusion criteria. The saliva samples were collected by the Navazesh method (26). The two groups were matched in terms of age and gender. The salivary cortisol level was measured by the cortisol ELISA kit (Ideal Co., Iran) in both groups (27). The level of cortisol was determined according to the reference curve (28).

To compare the level of salivary cortisol and the anxiety score in the two groups with and without geographic tongue, the Mann-Whitney test was used due to non-normal data distribution. The Spearman's correlation coefficient was also used to analyze the relationship between the cortisol level and the anxiety score. All tests were performed at a

significance level of 5% using SPSS version 23 (SPSS Inc., IL, USA).

Results

The mean cortisol level in patients with geographic tongue was 0.89 µg/dL. This value was 1.29 µg/dL in the control group. Cortisol levels were lower in patients with geographic tongue than healthy controls. However, this difference was not significant ($P>0.05$). As shown in Table 1, the anxiety scored based on the Beck Anxiety Inventory was low in 57.1% of controls who did not have geographic tongue, and 23.8% of controls had mild anxiety.

The Kolmogorov-Smirnov test showed that the data had non-normal distribution in the patient group ($P=0.041$); thus, the Mann-Whitney test was used to compare the two groups regarding cortisol level, which revealed a significant difference such that the cortisol level was higher in the control group ($P=0.01$). Comparison of anxiety in patients with geographic tongue and control group showed that the mean anxiety level was higher in patients with geographic tongue. However, this difference was not significant ($P>0.05$).

Discussion

Geographic tongue is a common complication that mostly affects the lateral and dorsal margins of the tongue (1). No study has identified a specific cause for this condition, but factors such as stress, allergy, genetics, and systemic conditions have been reported to play a role in its development (29). Psychological and physical stress have similar effects on the body's physiological system. The response to biological stress in the body is mainly through two axes of the hypothalamus-pituitary-adrenal and the sympatho-adrenomedullary system. Van Stegeren et al. (16) showed that alpha-amylase increases both physical and mental stress while elevated cortisol levels were only significantly found in physical stress. Their results were in line with the present findings.

Based on the results of the present study, there was no significant relationship between the salivary cortisol level and geographic tongue, and cortisol level was significantly higher in the control group. There was no significant correlation between anxiety and cortisol level. The reason for this result could be that other

factors involved in development of geographic tongue play more important roles than stress. Alikhani et al. examined immunological and psychological factors in patients with geographic tongue. They reported elevated levels of tumor necrosis factor alpha, IL6, salivary cortisol, and anxiety. Their findings showed that levels of anxiety and cortisol were significantly higher in people with geographic tongue (2). In a study by Ebrahimi et al, a significant relationship was found between stress and geographic tongue (12). The results of a study by Abdulraheem also showed a significant relationship between stress and increased risk of geographic tongue (23).

Jainkittivong and Langlais studied the clinical features and factors related to geographic tongue in Thailand. They found no significant correlation between the occurrence of systemic problems and geographic tongue. Also, the difference in stress-related conditions in the case and control groups was not significant. Therefore, they concluded that stress could not be considered as an etiological factor for geographic tongue (10). Shulman and Carpenter (5) examined the prevalence and risk factors related to geographic tongue in an American population. They used a depression assessment questionnaire to assess the mental health of patients and found that geographic tongue was not significantly associated with any mental condition. Rungsiyanont et al. (22) evaluated stress patterns using a stress questionnaire. In their study, 12% of patients with geographic tongue had severe stress. The results of their study showed that stress was not significantly associated with the occurrence of geographic tongue.

In the studies mentioned above, it seems that the level of stress was assessed, while our study was based on the assessment of level of anxiety. Given that geographic tongue can be a multifactorial disease and in the present study, only one factor i.e., anxiety was examined, the difference between this study and other studies can be due to other factors that can cause geographic tongue, which were not considered. Therefore, although the level of anxiety in the control group was lower than that in patients with geographic tongue, the level of salivary cortisol was higher in patients with geographic tongue, and therefore, the role of other factors can be more important than the role of anxiety in the occurrence of geographic tongue.

Table 1. Anxiety score in patients with geographic tongue and healthy controls using the Beck Anxiety Inventory (n=21)

Anxiety level	Patients (n=21)		Controls (n=21)	
	Number	Percentage	Number	Percentage
Low	8	38.1	12	57.1
Mild	4	19	5	23.8
Moderate	5	23.8	3	14.3
High	4	19	1	4.8
Total	21	100	21	100

Conclusion

Salivary cortisol level was significantly lower in those with geographic tongue than healthy controls, and there was no relationship between anxiety level and geographic tongue. Also, there was no significant relationship between anxiety and salivary cortisol level.

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Conflict of interest

None declared.

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References

- Pereira KM, Nonaka CF, Santos PP, Medeiros AM, Galvão HC. Unusual coexistence of oral lymphoepithelial cyst and benign migratory glossitis. *Brazilian journal of otorhinolaryngology*. 2009;75(2):318.
- Alikhani M, Khalighinejad N, Ghalaiani P, Khaleghi MA, Askari E, Gorsky M. Immunologic and psychologic parameters associated with geographic tongue. *Oral surgery, oral medicine, oral pathology and oral radiology*. 2014; 118(1):68-71.
- Hamissi J, Esfehiani M, Hamissi Z. Treatment of Geographic Tongue Superimposing Fissured Tongue: A literature review with case report. *Scholar Journal of Dental Sciences*. 2015;2:7.
- Motallebnejad M, Babaei N, Sakhdari S, Tavasoli M. An epidemiologic study of tongue lesions in 1901 Iranian dental outpatients. *The journal of contemporary dental practice*. 2008; 9(7):73-80.
- Shulman JD, Carpenter WM. Prevalence and risk factors associated with geographic tongue among US adults. *Oral diseases*. 2006; 12(4): 381-6.
- Honarmand M, Farhad Mollashahi L, Shirzaei M, Sehhatpour M. Geographic Tongue and Associated Risk Factors among Iranian Dental Patients. *Iranian journal of public health*. 2013; 42(2):215-9.
- Tarakji B, author c, Umair A, Babaker Z, SN A, Gazal G, et al. Relation Between Psoriasis and Geographic Tongue. *journal of clinical and diagnostic research*. 2014;8(11):ZE06-ZE7.
- Cigic L, Galic T, Kero D, Simunic M, Medvedec Mikic I, Kalibovic Govorko D, et al. The prevalence of celiac disease in patients with geographic tongue. *Journal of oral pathology & medicine : official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*. 2016;45(10):791-6.
- M GS. Geographic Tongue in Monozygotic Twins. *Journal of clinical and diagnostic research*. 2014;8(4):ZD01-ZD2.
- Jainkittivong A, Langlais RP. Geographic tongue: clinical characteristics of 188 cases. *Journal of Contemporary Dental Practice*. 2005; 6(1): 123-35.
- Guimarães ALS, Correia-Silva JdF, Diniz MG, Xavier GM, Horta MCR, Gomez RS. Investigation of functional gene polymorphisms: IL-1B, IL-6

- and TNFA in benign migratory glossitis in Brazilian individuals. *Journal of oral pathology and medicine*. 2007;36(9).
12. Ebrahimi H, Pourshahidi S, andisheh-tadbir A, Shyan SB. The Relationship between Geographic Tongue and Stress. *Iranian Red Crescent Medical Journal*. 2010;12(3):313-5.
 13. de Almeida Pdel V, Grégio AM, Machado MA, de Lima AA, Azevedo LR. Saliva composition and functions: a comprehensive review. *The Journal of contemporary dental practice*. 2008;9(3):72-80.
 14. Edgar WM. Saliva: its secretion, composition and functions. *British dental journal*. 1992; 172 (8):305-12.
 15. Humphrey SP, Williamson RT. A review of saliva: normal composition, flow, and function. *The Journal of prosthetic dentistry*. 2001; 85 (2):162-9.
 16. van Stegeren AH, Wolf OT, Kindt M. Salivary alpha amylase and cortisol responses to different stress tasks: impact of sex. *International journal of psychophysiology: official journal of the International Organization of Psychophysiology*. 2008;69(1):33-40.
 17. Hofman LF. Human saliva as a diagnostic specimen. *The Journal of nutrition*. 2001; 131 (5):1621s-5s.
 18. Kirschbaum C, Hellhammer HD. Salivary cortisol. *Scientific research* 2000; 3:379-84.
 19. NAKANE H, ASAMI O, YAMADA Y, HARADA T, MATSUI N, KANNO T, et al. SALIVARY CHROMOGRANIN A AS AN INDEX OF PSYCHOSOMATIC STRESS RESPONSE. *Biomedical Research*. 1998;19(6):401-6.
 20. Nater UM, La Marca R, Florin L, Moses A, Langhans W, Koller MM, et al. Stress-induced changes in human salivary alpha-amylase activity -- associations with adrenergic activity. *Psychoneuroendocrinology*. 2006;31(1):49-58.
 21. Scariot R, Batista TB, Olandoski M, Souza CM, Souza PH, Lima AA, et al. Host and clinical aspects in patients with benign migratory glossitis. *Archives of oral biology*. 2017; 73:259-68.
 22. Rungsiyanot S, Kittrongsiri P, Kriyawong P, Lumduan A, Antachai K. Relationship between physiological stress and geographic tongue among srinakharinwirot dental students. *SWU dental journal*. 2017;10(2):42-52.
 23. Abdulraheem S. Impact of stress on Geographic Tongue In Iraqi population. *MDJ*. 2015;12(1):107-15.
 24. Darwazeh AM, Al-Aboosi MM, Bedair AA. Prevalence of oral mucosal lesions in psoriatic patients: A controlled study. *Journal of Clinical Experimental Dentistry* 2012;4(5): e286-e91.
 25. Dafar A, Bankvall M, Garsjö V, Jontell M, Çevik-Aras H. Salivary levels of interleukin-8 and growth factors are modulated in patients with geographic tongue. *Oral diseases*. 2017; 23 (6):757-62.
 26. Dafar A, Çevik-Aras H, Robledo-Sierra J, Mattsson U, Jontell M. Factors associated with geographic tongue and fissured tongue. *Acta odontologica Scandinavica*. 2016;74(3):210-6.
 27. Yarom N, Cantony U, Gorsky M. Prevalence of fissured tongue, geographic tongue and median rhomboid glossitis among Israeli adults of different ethnic origins. *Dermatology (Basel, Switzerland)*. 2004;209(2):88-94.
 28. Hashemipour M, Rad M, Dastboos A. Frequency, Clinical Characteristics and Factors Associated with Geographic Tongue. *Journal of Dentistry*. 2008;9(1):83-92.
 29. Guimarães ALS, Correia-Silva JdF, Diniz MG, Xavier GM, Horta MCR, Gomez RS. Investigation of functional gene polymorphisms: IL-1B, IL-6 and TNFA in benign migratory glossitis in Brazilian individuals. *Journal of oral pathology and medicine* 2007;36(9):533-7.