

Evaluation of Cortisol Levels in Oral Ulcer Patients: A Descriptive Study

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ABSTRACT

Introduction: Cortisol levels are an indicator of the hypothalamic–pituitary–adrenal (HPA) axis and its response to stressors, so they are a valuable measure of pain or stress in individuals [Lai JCL. *Aging Sci* 2014;2(2):120.

Aims and objectives: To evaluate and compare the salivary cortisol concentration levels in patients with and without oral ulcers.

Materials and methods: A total of 10 patients visiting the outpatient department of a dental college were screened and evaluated for the presence of oral ulcers during their clinical visit. Five patients with oral ulcers were age and gender matched with five patients without oral ulcers. Their salivary cortisol concentrations were compared after obtaining detailed history and informed consent.

Results and conclusion: There was a marked increase in the salivary cortisol levels in two of five patients with oral ulcers indicating that there could be a strong association among the two. However, further evaluation with higher sample size would be needed to substantiate this finding.

Keywords: Cortisol, Oral ulcers, Saliva.

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INTRODUCTION

Cortisol was first discovered in the 1930s by Edward Kendall, Tadeus Reichstein, and Philip Hench.^{1,2} Cortisol levels in the human body range from 0.2 to 1.41 µg/dL in the morning and 0.04 to 0.41 µg/dL in the afternoon.³

Stress was defined by a Canadian physician named Hans Selye in 1930 as “a nonspecific response of the body to any demand for change.”³ Recurrent aphthous stomatitis (RAS) more commonly known as oral ulcers/canker sores has been associated with stress. The prevalence

of aphthous stomatitis has been recorded to be as high as 66%. Recurrent aphthous stomatitis can be classified as minor, major, and the herpetiform types. Minor aphthous ulcerations are the most common type and represent the pattern present in majority of cases (80%). Major aphthous ulcers occur in 10% of the population and the rest form herpetiform type of ulcers.⁴ Stress has been the most common factor to be linked with RAS. All the previous studies have linked RAS to psychological disturbances.⁵

A study of the patient’s blood profile can enlighten us regarding the association of cortisol, stress, and oral ulcers.

Other noninvasive methods that could be used include methods like saliva and urine analysis for content of cortisol. Renal secretion depends on tubular and glomerular functions; hence the rate of cortisol secreted daily via urine depends on the proper procedure of collecting urine over 24 hours. 70% of unbound cortisol is secreted by saliva through the basolateral membrane of salivary gland acini by diffusion.⁶

Psychological assessment has been done using scales like self-reporting or evaluation by a psychiatrist. The aim of this study is to find an association between salivary cortisol, stress, and oral ulcers.

MATERIALS AND METHODS

The present study was conducted at the Department of Oral Pathology, GITAM Dental College & Hospital, Visakhapatnam, after a proper institutional ethical clearance. Ten patients with RAS (5 males and 5 females) were taken for the study after informed consent. Ten healthy age- and gender-matched individuals were taken as controls.

Subjects included had the minor form of RAS. They were not under any medications, especially steroids or oral contraceptives, had no history of radiotherapy, no debilitating diseases like cancer, were not pregnant or lactating women, and did not have any systemic disorders, such as endocrine or metabolic diseases. The diagnosis of RAS was proven by history, clinically and histopathologically.

Unstimulated saliva samples were collected in both the study and control groups using Navazesh et al⁷

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Fig. 1: Aphthous ulceration present on left buccal mucosa

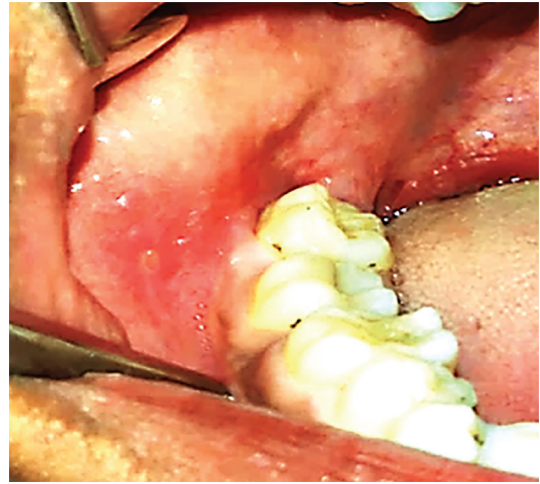


Fig. 2: Aphthous ulceration present on right buccal mucosa

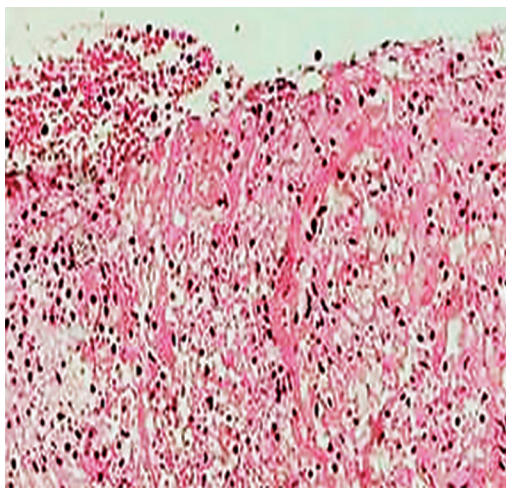


Fig. 3: Loss of epithelium with inflammatory cell infiltration and loose edematous connective tissue

method. The saliva was collected between 9 and 10 a.m. before any meal to avoid diurnal variation, and 5 mL of saliva was collected and stored at -20°C . Subsequently, after the required samples were collected, the saliva was subjected to centrifugation for 15 minutes at 3,000 rpm and cortisol estimation was carried out by enzyme-linked immunosorbent assay (ELISA).

Incisional biopsy and histopathological examination was performed to confirm the diagnosis of aphthous ulcers (Figs 1 to 3). Psychological assessment was done with the help of depression, anxiety, and stress scale (DASS, Table 1).

The questionnaire consisted of 21 questions with each score ranging from 0 to 3, 0 being “completely not applicable to me” to 3 as “most applicable to me.” The final stress score of the test was given as normal, mild, moderate, severe, and extremely severe (Table 2).

The DASS is a quantitative measure of distress along the three axes of depression, anxiety, and stress and is categorical measure of clinical diagnosis.⁸

RESULTS

As the sample size was 10, a descriptive analysis was deemed fit for the same. Therefore according to the sample size, we received five males and five females in the study group and in the control group.

Age: Four subjects were in the age group of 19 to 29 years, five were between 30 and 39 years, and only one was above 40 years.

Number of ulcers: Two subjects had two ulcers, two had three to four ulcers, and one had between four and five ulcers.

Cortisol and DASS levels: The cortisol and DASS levels were evaluated and compared. The results revealed that 6 subjects had a cortisol level $>1.5 \mu\text{g/dL}$ with DASS score of moderate, 2 subjects had cortisol levels $>2 \mu\text{g/dL}$ with DASS score of severe, and 2 had levels of $0.5 \mu\text{g/dL}$ with DASS score of mild.⁸

DISCUSSION

Oral ulcers or RAS can have a defined impact on the quality of life of individuals and much work has been done in this regard. The burning sensation, inability to eat food, and duration of pain lasting for about a week or more profoundly affects people already in stress.⁵ There are studies which have proven that stress can play an impact on the formation of ulcers. The present study revealed an association with the presence of ulcers and also the psychological status of the individual.⁵

McCartan et al conducted a study and investigated a possible relation between hospital anxiety and depression with the presence of ulcers. Albanidou-Famaki et al found an association between state and trait anxiety, measured by Spielberger’s state–trait anxiety inventory and the serum and salivary cortisol levels and concluded that stress can play an important role in the causation of RAS.⁵

Table 1: Depression, anxiety, and stress scale 21

Sl. no.		N (NA)	S (Sometimes)	Occasionally	AA (Always)
1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I experienced breathing difficulty (absence of physical exertion)	0	1	2	3
4	I found it difficult to work up the initiative to do things	0	1	2	3
5	I tended to over-react to situations	0	1	2	3
6	I experienced trembling (e.g., in the hands)	0	1	2	3
7	I felt that I was using a lot of nervous energy	0	1	2	3
8	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
9	I felt that I had nothing to look forward to	0	1	2	3
10	I could not seem to experience any positive feeling at all	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	Felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I was not worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (e.g.) sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Table 2: Depression, anxiety, and stress scale score range

DASS-normal score (range)
Normal (0–78)
Mild (78–87)
Moderate (87–95)
Severe (95–98)
Extremely severe (98–100)

Stress has been shown to alter the normal functioning of the sympathetic and parasympathetic branches of the nervous system and can dysregulate the functioning of hormones by over-producing or under-producing them.

CONCLUSION

Finally, we would like to conclude by stating that stress could play an important role in the pathogenesis of ulcers. Further studies with a larger sample size are necessary to possibly correlate the cortisol levels in the saliva and the psychological condition of individuals.

REFERENCES

- Lai JCL. Psychosocial stress and salivary cortisol in older people: a brief review. *Aging Sci* 2014;2(2):120.
- Fukuda S, Morimoto K. Lifestyle, stress and cortisol response: Review II: Lifestyle. *Environmental Health and Preventive Medicine*. 2001;6(1):15-21.
- Bozovic D, Racic M, Ivkovic N. Salivary cortisol levels as a biological marker of stress reaction. *Med Arh* 2013 Oct;67(5):374-377.
- Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology. 3rd ed. St Louis (MO): WB Saunders; 2009. p. 700-701.
- Nadendla LK, Meduri V, Paramkusam G, Pachava KR. Relationship of salivary cortisol and anxiety in recurrent aphthous stomatitis. *Ind J Endocrinol Metab* 2015 Jan-Feb;19(1):56-59.
- Yehuda R, Halligan SL, Yang RK, Guo LS, Makotkine I, Singh B, Pikholtz D. Relationship between 24-hour urinary-free cortisol excretion and salivary cortisol levels sampled from awakening to bedtime in healthy subjects. *Life Sci* 2003 Jun 6;73(3):349-358.
- Navazesh M. Methods for collecting saliva. *Ann N Y Acad Sci* 1993 Sep 20;694:72-77.
- Osman A, Wong JL, Bagge CL, Freedenthal S, Gutierrez PM, Lozano G. The Depression Anxiety stress scales-21 (DASS 21): further examination of dimension, scale reliability and correlates. *J Clin Psychol* 2012;68(12):1322-1338.