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Article

Gingival health status in relation to salivary irisin in oral ulcerative patients of Diyala city, Iraq

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ABSTRACT

Background: Gingivitis is the inflammation of the gingival tissue around the teeth initiated by bacteria. Irisin is a newly identified novel anti-inflammatory effect of adipocytokine. Recurrent aphthous ulcer (RAU) remains the most common ulcerative disease in the mucosa tissue of the oral cavity, existing as repeated onset of single or multiple painful ulcers. The study aims to evaluate gingival health status in relation to salivary irisin in oral ulcerative patients of Diyala City/ Iraq. The total sample consists of 200 patients taken from the specialized dental center in Ba'aquba / Diyala governorate from January-March 2022 for both genders within the 20- 31 age group. One hundred patients complaining of recurrent aphthous ulcers without systemic diseases were selected, and 100 patients were free from recurrent aphthous ulcers. The gingival inflammation was examined and recorded using Loe and Silness (1964). According to WHO (1997), a recurrent aphthous ulcer was assessed, and salivary irisin levels were determined using enzyme-linked immunosorbent assay (ELISA). In the study and control groups, the prevalence of gingivitis was 100%, with a higher mean value of GI among the study group than the control group. Minor ulcer prevalence was higher than a significant ulcer. The level of irisin was higher in the study group than in the control group, and the correlation between GI and irisin was negatively weak in the study and positively weak in the control group.

Keywords: Gingival health, Irisin, RAU.

INTRODUCTION

Periodontal diseases are destructive inflammatory conditions that lead to tooth loss by affecting the supporting structures of the teeth (the gingiva, bone and periodontal ligament). It is the most common disease in the world and includes two conditions: gingivitis and periodontitis [1].

Gingivitis is a milder, reversible form of periodontal disease, which includes inflammation of the gingival tissue and is caused by bacteria that present in the dental plaque, a microbial biofilm that adheres to the teeth and gingiva surface; the gums become swollen and red and may bleed but without resorption of supporting alveolar bone [2]. In disease-susceptible individuals, the gingivitis may proceed to periodontitis, where there will be loss of the periodontal attachment

and cause deep periodontal 'pockets' that are a lineament of the disease and lead to tooth loss [3]. The vital role of pathogenic microorganisms in periodontal disease has been studied, and it was found that only bacteria may be insufficient to establish the disease [4].

Although periodontal diseases are initiated and sustained by the microbial biofilm of the dental plaque, it is believed that the host response plays an essential role in the breakdown of connective tissue and bone. Virulence factors and microbial antigens trigger an inflammatory and immune reaction. The response differs among individuals, depending on potential variations in cytokine and other antimicrobial responses, environmental factors, and the subjects' genetic makeup [1].

The most common types of gingivitis are plaque-induced, acute ulcerative necrotizing, hormonal, spontaneously presenting hyperplastic or drug-induced gingivitis. The plaque-induced gingivitis is a more predominant form of gingivitis. This type accounts for far more cases than all other variants combined. [5]. Saliva is vital in controlling inflammatory conditions in a periodontal disease through several proteins in saliva. Irisin is a newly identified adipokine, and research has revealed that it has anti-inflammatory effects. A novel myokine, it has been one of the most investigated peptides in recent years [6] and exhibits autocrine and paracrine effects; it comprises 112 amino acids, mainly synthesized in skeletal muscle and adipose tissue [7]. Irisin has been present in all three salivary glands, and the parotid gland produces most. The submandibular gland releases the moderate level, while the sublingual gland produces the least. It induces the conversion of white adipose tissue into brown adipose tissue. In addition, it regulates thermogenesis, energy expenditure, weight loss, and ultimately glucose homeostasis by increasing uncoupling protein 1 in brown adipose tissue [8]. Initially, it was described as a myokine secreted in response to physical exercise from skeletal muscle, but later, it was found to be also secreted from adipose tissue [9]. Irisin is also regulated and expressed in human periodontal ligament cells, dental pulp stem cells and osteoblasts [10]. As well, irisin has been involved in cementoblast differentiation [11].

Recurrent aphthous ulcer (RAU), known as canker sores or recurrent aphthous stomatitis (RAS), is the most common oral mucosal disease in children and adults [12]. These present as recurrent, multiple, small, ovoid or round ulcers with circumscribed margins having gray or yellow floors and are surrounded by erythematous haloes present first in childhood or adolescence [13]. There are three types: minor, major and herpetiform aphthous ulcers. RAU is a painful, repeated inflammatory process of the oral mucosa that is found to be secondary to various disease processes [14].

MATERIALS AND METHODS

A cross-sectional comparative study was done from the end of December (2021) till the end of March (2022). The total sample size is composed of 200 patients who are taken from the specialized dental center in the Ba'aquba ⁄ Diyala governorate of both genders and different age groups (20-31). One hundred patients complaining of recurrent aphthous ulcers without any systemic diseases were selected, and 100 patients were free from recurrent aphthous ulcers, with the sub-sample composed of a study group of 45 patients with RAU and a control group of 45 patients free of RAU. Ethical approval was achieved from the University of Baghdad; the ethical committee approved the study protocol, and all participants signed informed consent. All patients were examined by a single examiner under standardized conditions, with the oral cavity examined by using a chair light and mirror. The gingival inflammation was examined and recorded

using Loe and [15] gingival index (GI) by using a periodontal probe. The recurrent aphthous ulcer was assessed according to directions suggested by the [16]; for all participants, case sheets were filled, which included demographic information regarding age and gender. Medical history, the site, type, and frequency of RAU were recorded. Unstimulated Salivary samples will be collected by spitting into the test tube according to [17] before clinical evaluation between 9 to 11 A.M. using a ten-minute timer. Instructions were given to all patients that they should be free from acute illness or chronic disease, have no medication, not eat or drink except water one hour before collection, and not smoke or undergo heavy physical activity after the saliva collection. The salivary samples were centrifuged for approximately twenty minutes at (2000-3000 rpm), then all samples were kept stored at a temperature of about -20 C [18] until the time of biochemical and immunological analysis; salivary irisin level was measured by using enzyme-linked immune sorbent assay (ELISA).

Statistical Analysis

Data description, analysis and presentation were performed using a statistical package for Social Science (SPSS version 22, Chicago, Illinois, USA). For the quantitative variable mean, standard deviation (SD) was used. Frequency percentage used for the qualitative variable. Independent sample T-test was used for the difference between the two groups. Pearson correlation is used for the linear correlation between two quantitative variables. For the level of significance, not significant P>0.05, Significant P<0.05.

RESULT

The mean values of the gingival index for each group are seen in Table 1; the mean value of GI among groups with ulcers (study group) was higher than groups of ulcers-free (control group) with a statistically significant correlation between them (p=0.000).

	Groups	Mean	±SD	T	df	P value
	Study	0.393	0.200	6.779	143.594	0.000 Sig.
	Control	0.242	0.098			

Table 1. Descriptive and statistical test of GI among groups.

The distribution of the gingival inflammation according to the severity is seen in Table 2; the prevalence of gingivitis was 100% in both study and control groups; mild gingivitis was the most prevalent type among the control group, while moderate gingivitis was the most prevalent one among the study group. In both groups, no severe gingivitis cases were recorded.

			Groups		Total
			Study	Control	
	Mild"0.1-1"	N.	98	100	198
		%	98.00	100.00	99.00
	Moderate"1.1-2"	N.	2	0	2
		%	2.00	.00	1.00

Table 2: Distribution of GI severity among groups.

Table 3 showed that a minor ulcer was present in 83 samples and a significant ulcer in 17 samples, while no herpetiform ulcer was seen.

Variable	Cats.	No.
Type	Minor	83
	Major	17

Table 3: Distribution of samples by ulcer type.

Results in Table 4 demonstrate the correlation between GI and irisin; it is negatively weak and insignificant in the study, while positively weak and not significant in control.

Groups		GI	
		r	p
Study	Irisin	-0.163	0.285
Control	Irisin	0.240	0.112

Table 4: Correlation between GI and Irisin by groups.

DISCUSSION

In the present study, the mean value of GI among patients with ulcers (study groups) was higher than that of patients with ulcers free (control groups), with a statistically significant correlation between them (p=0.000) and also showed the prevalence of gingivitis was 100% in both study and control groups, the mild gingivitis was the most prevalent type among the control group. In contrast, moderate gingivitis was the most prevalent among the study group. This agrees with [19,20] that found the scores of periodontal indices were higher in the study group than the control group. The neuropathological mechanisms of primary ulcer formation have been related to immune disturbances in innate or adaptive cellular mechanisms [21, 22]. Dental plaque is the etiological factor in dental caries and periodontal diseases, which plaque removal prevents. Tooth brushing and dental flossing are effective methods for controlling plaque and reducing periodontal disease and probing depth [23] because the oral ulcer is painful, limiting effective, regular tooth brushing and leading to poor oral health in recurrent aphthous ulcer[s] [19] .So, low tooth brushing numbers in RAU in the present study may be associated with poor oral hygiene. The impaired oral hygiene leads to increased oral microbial stimuli and may trigger further oral ulcer formation in these patients [24]. While [25] reported that the sulcus bleeding index records the presence of initial gingival inflammation. So, due to a direct role in disease pathogenesis or a secondary effect of impaired oral hygiene, there is a close association between periodontal disease and RAU in the present study.

Irisin is also expressed and regulated differently in human periodontal ligament cells, dental pulp stem cells and osteoblasts [10]. Other than this, irisin is involved in cementoblast differentiation as well [11]. This study showed that the correlation between GI and irisin is negative, weak, and insignificant, while positive, weak, and insignificant in control. This result does not agree with [26], who reported a positive insignificant correlation. Such results must be clarified by more molecu-

lar investigations level, and more studies like sample size or more to approve the results and other suggestions may be the recurrent aphthous ulceration acts as causative factors to elevate GI in the study group.

The present study showed a minor ulcer was present in 83 samples and a major ulcer in 17 samples, while no herpetiform ulcer was seen; this gives credence to the fact that minor RAU is the most common type [27,32] whose the minor ulcer was higher than major ulcer, and not agree with [33] who found that major ulcer was higher than minor ulcer, so this relation is variable and could be related to the differences in a sample of the population selected.

CONCLUSION

There is increased gingival inflammation in recurrent aphthous ulcers with a negative, weak correlation of gingival index with irisin.

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