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Study the activity of salivary amylase and lipase in Iraqi women with systemic lupus erythematosus

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ABSTRACT

Systemic lupus erythematosus (SLE) is a complex multisystem autoimmune disease associated with immune dysregulation, with reported incidences ranging from 1 per 100,000 individuals. The precise cause of SLE is still unknown. However, it is generally accepted that multiple factors, including immunological, genetic, and environmental influences, may interact to produce the disease. Any of these factors may contribute to its chronic course. Saliva contains a range of protective proteins, including high levels of amylase and lipase. The aim of this study was to determine whether there is an association between salivary amylase and lipase and systemic lupus erythematosus in women. Ninety Iraqi females aged 20-50 years were included, consisting of 50 patients with systemic lupus erythematosus and 40 healthy controls. Salivary amylase and lipase levels were measured by a colorimetric method. Salivary lipase and amylase in females with lupus were higher than those in healthy controls. These findings suggest that salivary amylase and salivary lipase may be associated with disease progression and may serve as potential markers for predicting systemic lupus erythematosus in women.

Keywords: *Amylase, BMI (Body mass index), Lipase, Saliva, Systemic lupus erythematosus*

1 INTRODUCTION

Lupus is a recurrent, multisystem autoimmune illness that can affect almost every organ system [1, 2]. It lacks a characteristic presentation, which makes diagnosis difficult even for skilled clinicians. The presence of autoreactive B and T cells and the production of a diverse series of autoantibodies are characteristics of systemic lupus erythematosus (SLE). More than fifty genes have been associated with systemic lupus erythematosus [3–5]. Sex also contributes to disease vulnerability, given that the risk of developing SLE is nine times higher for women of childbearing age than for men [6]. Systemic lupus erythematosus is a chronic inflammatory autoimmune condition [7, 8]. SLE autoantibodies can attack almost all organ systems, including the salivary glands, leading to hallmark symptoms such as severe xerostomia and dental caries [9–11]. Patients with active SLE had a 100% dental caries rate, while those with inactive SLE had an 85% incidence [12].

Saliva is one of the most important secretions in the human body and is produced by the salivary glands [13]. It contains hormones, antibodies, growth factors, enzymes, microorganisms, and their byproducts. Through extracellular ultrafiltration, active transport, or passive diffusion, many of these components enter saliva from the blood. As a result, saliva often reflects the body's physiological processes [14]. It maintains the integrity of the hard and soft tissues of the mouth and is one of the major natural defensive mechanisms of the oral cavity. A biomarker is any biological molecule found in blood, other body fluids, or tissue that indicates a normal or abnormal process, state, or disease. Saliva is a biological fluid with clinical information that can be used for new prognostic strategies, laboratory or clinical diagnosis, and patient monitoring and treatment for both systemic and oral disorders [15].

Amylase (EC 3.2.1.1) is an enzyme that catalyzes the conversion of starch into sugars. The chemical breakdown

of food begins with the action of amylase, an enzyme present in human saliva and in the saliva of several other species. Alpha-amylase, which is secreted by both the salivary glands and the pancreas, breaks down dietary starch into smaller molecules such as polysaccharides and disaccharides. These molecules are then further processed by additional enzymes into glucose, which serves as a vital source of energy for the body [16]. Lipase (EC 3.1.1.3) is an enzyme that catalyzes the hydrolysis of fats (lipids). Lipases are required for the processing, transport, and digestion of dietary fats. The primary digestive enzyme in humans that converts dietary lipids into mono-glycerides and two fatty acids is human pancreatic lipase (HPL). Some lipase activities are limited to specific cell compartments, whereas others function in extracellular spaces [17].

2 MATERIALS AND METHODS

Fifty female patients with systemic lupus erythematosus, aged 20-50 years, were enrolled in this study. A specialist made the clinical diagnosis for all patients. They were seeking treatment at the Baghdad Teaching Hospital. The control group consisted of forty healthy females aged 20-50 years. They were in good health, had no systemic disorders, and were not taking any medications. Between 10:00 am and 12:00 pm., 5 mL of unstimulated whole saliva was collected while the subjects were at rest. After rinsing their mouths with water, the subjects were instructed to drool into a large test tube. The saliva was then centrifuged for ten minutes at 4000 rpm. Before analysis, the resulting supernatant was stored in polyethylene tubes at -20 °C. Salivary lipase and amylase levels were measured by a colorimetric method using kits from Spin-react (Spain), following the instructions in the leaflet. Statistical analysis was performed using SPSS version 29 (Statistical Package for the Social Sciences). The findings were expressed as mean ± SD, where SD indicates standard deviation. An independent t test was used to evaluate the significance of differences between groups. The correlation coefficient (r) and cluster analysis were also applied.

3 RESULTS AND DISCUSSION

This study included a total sample of 50 female patients and 40 female controls. The demographic characteristics of the patients and control subjects are shown in Table 1. By age, the mean ± standard deviation of patients with SLE was 34.72 ± 8.656 years, while that of the control subjects was 35 ± 8.418 years. There was no significant difference between the groups regarding the age. By body mass index (BMI), there was a significant increase (p = 0.001) in the patient group compared with the control group (29.100 ± 3.409 and 26.095 ± 4.549, respectively). Salivary amylase and salivary lipase levels in female patients with SLE were significantly higher than those in healthy control subjects (159.30 ± 201.472 and 156.90 ± 168.554 versus 59.38 ± 18.199 and 55.85 ± 19.200, respectively).

Table 2 indicates that the correlation between amylase, lipase, and BMI in the current study. The results revealed that each for amylase and lipase has moderate positive correlation with BMI and strong positive correlation between amylase and lipase in the patients.

Table 1 Features of SLE patients and healthy controls

		Amylase	Lipase	Age	BMI
Control	Mean	59.38	55.85	35	26.095
	N	40	40	40	40
	Std. Deviation	18.199	19.200	8.418	4.549
Patients	Mean	159.30	156.90	34.72	29.100
	N	50	50	50	50
	Std. Deviation	201.472	168.554	8.656	3.409
p- value		0.002	0.001	NS	0.001

Table 2 Correlation among BMI, amylase and lipase

Correlations				
		BMI	**Lipase**	**Amylase**
BMI	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	50		
Lipase	Pearson Correlation	.499**	1	
	Sig. (2-tailed)	<.001		
	N	50	50	
Amylase	Pearson Correlation	.446**	.670**	1
	Sig. (2-tailed)	<.001	<.001	
	N	50	50	50

Note. **. Correlation is significant at the 0.01 level (2-tailed).

The diagnostic accuracy of separating SLE from healthy control participants using salivary amylase concentrations was evaluated by receiver operating characteristic (ROC) analysis. The optimal salivary amylase (U/L) area was 0.694 with a 95% confidence interval (CI), as shown in Table 3 and Figure 1. In addition, salivary lipase (U/L) showed an area value of 0.777 with a 95% confidence interval (CI), as presented in Table 4 and Figure 2.

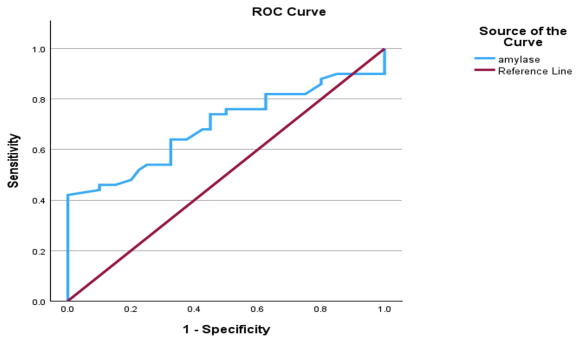

Fig. 1 Receiver Operating Characteristic curve analysis of amylase

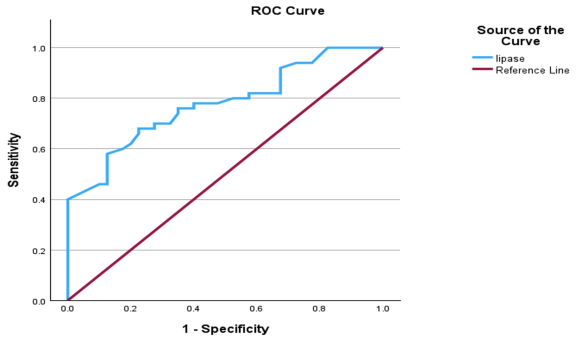

Fig. 2 Receiver Operating Characteristic curve analysis of lipase

SLE affects individuals who are genetically predisposed, can be triggered by external factors, exhibits diverse immune dysregulation, and causes tissue damage [18]. Patients with SLE show defects in B-cell tolerance, autoantigen-responsive T-helper cells, biochemical and functional alterations in intrinsic T cells, excessive autoantibody synthesis, and abnormal cytokine levels [19–21]. These factors lead to increased production of helper T cells in females, which may contribute to the development of autoimmunity because these cells act as stimulators [22]. The salivary levels of molecules reflect their blood levels, since the majority of blood molecules can move into saliva [23]. In many disorders, saliva has been increasingly used as a useful diagnostic or disease activity marker [24]. Saliva can be obtained simply and painlessly without causing negative side effects. For this reason, saliva has been widely used in studies on stress. In addition, markers specific to salivary diseases must continue to be studied in the fields of diabetes, Sjogren syndrome, oral cancer, and asthma [25–28].

Children with childhood-onset disseminated lupus erythematosus may develop excessive protein loss from the digestive tract or related autoimmune conditions such as Coeliac Disease (CD) or Autoimmune Hepatitis [29]. Crişcov et al. described a 6-year-old girl presenting with malaise, pain, loss of appetite, and abdominal bloating. She was diagnosed with SLE following three weeks of arthralgia and a malar rash. Blood tests revealed anemia and IgA deficiency, while clinical features suggested a commonality between the diseases. High anti-IgG tissue transglutaminase (tTG) antibody titers (120 EU/mL) and positive small intestinal biopsies (Marsh classification stage IIIB1) confirmed CD [30]. Dima et al. investigated 126 patients with SLE, screening for anti-endomysial antibodies (EMA), deamidated gliadin peptides (DGPs), tTG-IgA, and total serum IgA. None of the patients had a prior diagnosis of CD. Their findings revealed a higher prevalence of tTG-IgA positivity in SLE patients compared with the general population, although EMA positivity was not elevated. Additionally, no significant correlation was observed between DGP levels and SLE clinical features [31].

Ahmed EA and Kuba RH examined gender distribution among SLE patients and found that females were disproportionately affected, with women representing 87.5% of cases (49 out of 56 patients) [5]. This gender disparity is consistent with other findings, suggesting that hormonal influences may play a significant role in the heightened immune response observed in females, contributing to the increased incidence of SLE [32]. Systemic lupus erythematosus is an autoimmune illness that affects connective tissue and involves several organ systems, including the heart, kidneys, joints, gastrointestinal tract, and nervous system. Another study describes a patient with involvement of the skin, thyroid, central nervous system, pancreas, and salivary glands. Notably, the patient's salivary lipase and amylase levels were consistently elevated [33]. A case of systemic lupus erythematosus with involvement of the pancreas, salivary glands, central nervous system, thyroid, and skin, as well as numerous organ injuries and steadily rising blood lipase and amylase levels, has also been documented in various studies. The patient, a young woman, had been affected by the illness for almost 13 years. Her lipase and amylase levels continued to rise with recurrence, but there were no accompanying imaging or clinical symptoms [34].

Table 3 Receiver Operating Characteristic (ROC) Curve analysis of amylase

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.694	0.056	0.000	0.585	0.803

Note. a. Under the nonparametric assumption.
b. Null hypothesis: true area = 0.5

Table 4 Receiver Operating Characteristic (ROC) Curve analysis of lipase

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.777	0.048	0.000	0.683	0.871

Note. a. Under the nonparametric assumption.
b. Null hypothesis: true area = 0.5

More clinical research is necessary because there are currently few investigations on elevated serum or salivary amylase and lipase activity in individuals with lupus erythematosus.

4 CONCLUSION

The increased activity of salivary lipase and salivary amylase in women with lupus indicates an immunological role for these salivary enzymes. Body mass index (BMI) also affects enzyme activity.

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No funds received.

ABBREVIATIONS

Systemic lupus erythematosus (SLE), Body mass index (BMI), Enzyme Commission number (EC), human pancreatic lipase (HPL), receiver operating characteristic (ROC), confidence interval (CI), Coeliac Disease (CD) , High anti-IgG tissue transglutaminase (tTG) , anti-endomysial antibodies (EMA), deamidated gliadin peptides (DGPs) .

DECLARATIONS

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Consent to publish

All authors consent to the publication of this work. Written informed consent for publication was obtained from the participants.

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