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Evaluation of Salivary Protein Carbonyl in Women with Polycystic Ovary Syndrome

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Abstract

Background: Polycystic ovary syndrome (PCOS) is a common endocrine condition affecting fertile women. It is a complicated illness that affects both general and oral health. The current study was conducted in order to evaluate the state of gingival health in a group of women suffering from a condition called polycystic ovarian syndrome and to establish the correlation between gingival health and the levels of salivary protein carbonyl in unstimulated saliva. Material and Method: The cross--sectional comparison analysis was executed at Al-Zahraa specialty hospital/gynecological outpatient clinic in Al-Miqdadiyah city, Diyala ,Iraq. The sample consist of 80 women (40 with polycystic ovary syndrome as a study group and 40 women as a control group) was between ages of 25 and 30 with a BMI of 18.5-24.9 (normal weight). Under standard settings, the salivary protein carbonyl concentration was determined in unstimulated saliva.

Results: In the present study salivary protein carbonyl (PC) concentration and mean value of(PI,GI) were higher among study group than in control group ($P<0.05$). Likewise the association involving salivary protein carbonyl and plaque with gingival indies in the Polycystic ovarian syndrome group was a positive significant correlation ($P<0.05$.). Conclusion: The females with polycystic ovarian syndrome expressed higher gingival inflammation and oxidative stress than the females without the syndrome ,so it is important to concentrated effort toward preventive and educational oral health activities to improve the gingival health of the females with polycystic ovarian syndrome.

Introduction:

A complex hormonal disorder known as polycystic ovarian syndrome impacts between 6% and 22% of women globally (1,2). The chief signs of this difficult disorder are menstrual irregularities, hyperandrogenism, obesity, aberrant lipid profiles, and insulin resistance (IR) in certain women. Polycystic ovarian syndrome is the most widespread cause of female sterility and is linked to an increased risk of cancer of the endometrium, cardiovascular disease, type 2 diabetes, and psychological difficulties such as anxiety and depression, as well as eating disorders (3).

Dental plaque is an oral biofilm, or bacterial clump, that develops on the surface of teeth, often at or below the gingival line borders (4). It is composed of living, dead bacteria and their products together with organic and inorganic compounds derived from saliva (5).

Gingivitis is a condition in which the gingival tissue becomes inflamed and is restricted to the soft and connective tissue of the gingival . There is no loss of attachment, and thus the junction epithelium does not migrate. It is a reversible inflammatory condition (6). Periodontal disease may be exacerbated by PCOS-related hormonal and metabolic problems (7). PCOS patients had a higher PI and gingival index (GI) than healthy controls (8). The term "oxidative stress" refers to indicates to an imbalance between the oxidation and antioxidation processes that results in a change in the redox state of cells. Active oxidation chemicals are able to damage DNA, proteins, lipids, carbohydrates, and other substances (9-11). One of the most significant oxidative changes is protein carbonylation, which is recognized as a unique hallmark of oxidative stress-related illnesses. It is an irreversible oxidative alteration caused by reactive oxygen species (ROS.) that inserts a carbonyl group into the polypeptide chain, creating structural changes with a major impact on protein function. (12).

Despite the remarkable complexity of PCOS pathophysiology, there is mounting evidence that oxidative stress (OS) plays a causal role in the disease's development (13). Numerous investigations have revealed that female PCOS patients have OS marker levels that are higher than normal (14, 15). Chronic low-grade inflammation describes polycystic ovarian syndrome (16). Chronic infections, such as gingivitis, which is a prevalent disease in PCOS patients, might create a prolonged undesirable inflammatory state (17).

Interactions between the host and the oral microbiome influence the onset and progression of periodontal diseases. Local microbial metabolism and systemic stress-induced dysbiosis, including hormone, toxin, and inflammatory cytokine imbalances, may result in a tenfold increase in immune cell migration from the gingival sulcus within the oral environment (18). According to the researchers, there has been no prior Iraqi investigation into the measurement of salivary levels of protein carbonyl and their relationship with gingival condition in women with PCOS; hence, this study was designed and carried out.

Materials and Methods

Study design .and sampling

The existing cross-sectional comparative study was carried out at Al-Zahraa specialist hospital /gynecological outpatient clinic in Al-Miqdadiyah city /Diyala /Iraq. The sample consist of (40 PCOS female as a study group and 40 healthy female as control group) and their companions without PCOS. Their age was between 25 and 30 years old, with a body mass index (BMI) of 18..5- 24.9 (normal weight,).

Inclusion and exclusion criteria

The following were the inclusion criteria for the current study: - a finding of PCOS patients done by a gynecologist according to the Rotterdam classification (19).

Exclusion criteria : pregnancy, Smoking , hormonal disturbances, any systemic disease , medication affecting the periodontium (antiepelptic drugs, antihypertensives, corticosteroids, NSAIDs, immunosuppressant drug hormones), Recent use of antibiotics and/or anti-inflammatory treatments,

Confounding pharmaceuticals (contraceptive agents, steroid hormones) , Use of nutritional supplements (vitamins, folic acid), and the existence of fewer than 20 natural teeth are done by self-report.

Diagnostic and measurement criteria:

The salivary samples were collected by drooling passively for five minutes into the graduated sterilized jar following the advice given by Navazesh and Kumer (20), and then centrifuged for approximately 20 min , The supernatant saliva was then separated and stored in the refrigerator at −20°C until analysis of the samples. Saliva samples were biochemically analyzed in line with the kit's guidance using a Human PC ELISA Package (Bio search Laboratory/China) for the protein carbonyl. Dental plaque was scored by the Silness and Löe plaque index(21), while gingival inflammation was scored by Löe gingival index (22).

Statistical methods

The data set was analyzed by way of (Statistical Package for Social Science (SPSS) version -22,, Chicago, Illinois, USA). The following data analysis methods were used: Mean, Standard deviation((SD), Paired t-test, and Pearson Correlation (r). G Power version 3.1.9.7

A P,<0.05 probability value would be considered statistically significant.

Results

Table 1 shows the mean plaque index and gingival index values for study group and control group.

The mean value of the plaque index was found to be greater in the study group than in the control group, with a significant difference (P,<0.05). Furthermore, the mean gingival index value was greater in the female with PCOS group than in the control group (P,,<0.05).

Table 2 displays the mean and standard deviation of salivary protein carbonyl for the study and control groups. Salivary protein carbonyl (PC) concentrations were found to be higher in the study group as compared to the control group, with a significant difference (P ,<0.05) between the two groups.

The relationship between salivary protein carbonyl and oral factors (PlI and GI) is shown in Table 3. The correlations between salivary (PC) and (GI with PlI) were shown to be positive (P<0.05) in the female with PCOS group.

Table 4 shows correlation between gingival index with plaque index among the study and control groups . A positive weak not significant correlation was detected between GI and PII in the study and control groups (P>.0.05).

Table 5 showed sample distribution according to severity of gingival inflammation. Compared to the control group's 50%, the study group had a higher percentage of mild gingival inflammation (80%). Conversely, the study group observed a higher incidence of the moderate level of gingival inflammation (20%) in contrast to the control group's (2.50%).

Discussion

Several pathophysiological linkages have been proposed between PCOS and periodontal disease, including oxidative damage, insulin resistance (IR), low-grade systemic inflammation, and systemic hormonal substance levels (23).

In the current research, females in the study group had a statistically significant greater mean value of salivary protein carbonyl than the healthy control group. This finding was also confirmed by previous studies (24-27), However, the above mentioned studies were conducted in serum.

This result could be attributed to the fact that females with PCOS, there is an oxidant-antioxidant imbalance, which is caused by metabolic abnormalities that include hyperinsulinemia and dyslipidemia (28,29). Hyperglycemia causes an increase the reactive oxygen species ROS produced by mononuclear cells. Oxygen-free radicals, or ROS,, are produced aas waste products of metabolism and aerobic respiration. Consequently, the ovarian epithelium develops a vicious cycle, resulting in cyst development, low-quality ovarian

follicles, and sterility (30), However, this expression needs to be expanded in future studies.

The current investigation demonstrated that the study group had a higher mean value of the dental plaque index than the control group ($P< 0.05$). This might be explained by the fact that women with PCOS had worse oral habits compared to the control group; therefore, stressful PCOS is linked to a number of physiological and psychological symptoms, all of which progressively worsen self-neglect (31). The results appear to support the findings of other researchers (17, 32, 33), who found that PCOS increases periodontal bacteria counts in salivary secretions and their serum antibody response. This suggests that PCOS may affect oral microbiota by interacting with gingival and periodontal health in a way that is inconsistent with other conditions (34, 35). Therefore, the most important factor influencing the state of the gingiva was oral hygiene. It's common knowledge that periodontal disorders evolve in part due to tooth plaque (36).

Concerning gingival status , the findings of this research demonstrated a significant difference between the females in the PCOS group and the healthy female control group in the mean value of gingival inflammation. This result was also reported in previous studies (17, 34, 37, 38).

This may be explained by the fact that persistent inflammation in periodontal tissues is caused by systemic inflammation in metabolic disorders (39). One prevalent endocrine disorder is polycystic ovary syndrome, which impacts women's oral and systemic health and is marked by an imbalance in hormone levels(40) and that Particularly when linked to gingival inflammation, the hormonal alterations in PCOS are probably going to affect the salivary levels of potential periodontal pathogens or their systemic antibody responses. (33).

As stated by Laven et al (41), women with PCOS have higher levels of the estrogen hormone. The gingival tissue reacts to these higher levels of the hormone estrogen through enhanced capillary permeability and vasodilatation. White blood cells and fluid migration out of blood vessels are also increased. Periodic elevation of sexual steroid hormone synthesis often modifies the biology of the vascular and tissue of the gingiva, as well as detection by local immune system effector cells. (42, 43).

Sculley & Langley-Evans (44) found that the saliva of people with periodontitis had much greater PC levels and significantly lower total antioxidant capacity than the controls, and that there was a positive correlation between poor periodontal health and higher salivary protein carbonyl concentrations. The presence of protein carbonyls in the entire saliva was the study's primary finding, which showed that participants with the worst periodontal health condition were likely to have more oxidative damage.

The higher mean value in the gingival index among women with PCOS could also be attributed to the increased amount of salivary protein carbonyl (PC), an oxidative stress biomarker that can influence the beginning and progression of several inflammatory and infectious disorders, as measured by the greater level of ROS in this research as compared to the healthy without PCOS control group (45).

Therefore, polymorphonuclear leukocytes produce massive amounts of reactive oxygen species ((ROS) in reaction to local inflammation and bacterial microflora. These ROS oxidize lipids, proteins, and nucleic acids, damaging periodontal connective tissue. (46).

Conclusion

Based on the study's findings, women with PCOS were shown to have higher gingival conditions. As a result, in addition to excessive oral hygiene regimens, comprehensive preventive and educational programs are crucial for improving the gingival health status of PCOS women. This study's interesting conclusion is that women with polycystic ovarian syndrome may be diagnosed using elevated salivary protein as a marker.

Ethical Clearance: The ministries of the environment, health, higher education, and scientific research have ethically approved the research conducted there.

Conflict of interest: There is no conflict of interest declared by the authors.

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Table 1: Dental plaque with Gingival indices between studyand control group.

Variables	Study group		Control group		Statistical differencess		
	Mean	± SD	Mean	± SD	t--test	Df	P- value
Plaque index	0.917	0.303	0.383	0.373	7.024	78	0.000*
Gingival index	0.680	0.407	0.195	0.272	6.275	78	0.000*

* =highly significant P.< 0.001 df =78

Table 2: Salivary protein carbonyl level (mean± SD) among study group and control group.

Variables	Study group		Control group		Statistical differences		
	Mean	±SD	Mean	±SD	t-test	df	p-value
Protein carboyl ng/ml	54.664	19.109	29.506	13.712	6.765	78	0.000*

* =highly significant P < 0.001 df =78

Table 3: shows coefficient correlation between salivary protein carbonyl and dental plaque and gingival indices within the study and control groups.

Variables	PII				GI			
	Study group		Control group		Study group		Control group	
	r	P	R	P	r	P	r	P
PC ng/ml	0.377	0.017*	-0.038	0.817	0.457	0.003*	0.280	0.080

* = significant P < 0.05 Not significant* P>0.05

Table 4: Plaque and gingival index correlation between the study and control groups.

Variables	Study group		Control group	
	PII		PII	
	r	p	R	P
GI	0.172	0.289	0.254	0.114

Not significant P>0.05

Table 5: showed sample distribution according to severity of gingival inflammation.

Gingival severity	Groups				Total	
	Study group		Control group			
	N	%	N	%	N	%
Healthy	0	.00	19	47.50	19	23.75
0.1-1"Mild"	32	80.00	20	50.00	52	65.00
1.1-2"Moderate"	8	20.00	1	2.50	9	11.25

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