Original Research Article

Evaluation of periodontal health among patients with polycystic ovarian syndrome a cross sectional study

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ABSTRACT

Background: Polycystic Ovarian Syndrome (PCOS) and periodontal disease are common disorders associated with diabetes and cardiometabolic risk. Recently, some studies have revealed the effect of polycystic ovary syndrome (PCOS) on gingival inflammation. This cross-sectional study attempts to assess the periodontal health status and systemic inflammation of women receiving medical treatment for PCOS and women newly diagnosed with PCOS.
Methods: A total of 60 participants comprising 30 newly diagnosed patients with PCOS (PCOS-N), 30 patients with PCOS on medical treatment (PCOS-MT) were examined. Periodontal parameters were recorded and compared.
Results: This study resulted that the women with newly diagnosed PCOS may have increased prevalence and likelihood for periodontitis, with higher measures of periodontal inflammation and breakdown than those on medical treatment for PCOS.
Conclusions: In PCOS females, there is an alteration of various hormone levels in the body. These hormones might act on gingival cells by changing the effectiveness of the epithelial barrier to bacterial injury or by affecting the collagen maintenance and repair.

Keywords: Polycystic ovarian syndrome, Gingival disease, Periodontal disease

INTRODUCTION

Polycystic ovarian syndrome (PCOS), a commonly occurring hormonal condition affecting women of the reproductive age group with the prevalence ranging from 9.13%-36% in India.[1,2] This condition constitutes one of the leading cause of female infertility, which negatively creates an impact on various health systems. Hence, it is associated with insulin resistance, obesity, type 2 diabetes, dyslipidemia, cardiovascular disease and endometrial carcinoma.[3,4] It is characterized by chronic low-grade inflammation and it was reported that certain pro-inflammatory cytokines, such as interleukin-6 (IL-6), interleukin-17 (IL-17), tumor necrosis factor-α (TNF-α) were elevated in women with PCOS, compared to systemically healthy individuals.[4]

The complex pathophysiology of PCOS involves abnormalities in the hypothalamic-pituitary-gonadal axis.[5] In patients with PCOS there is an increased release of luteinizing hormone (LH) in relation to follicle-stimulating hormone (FSH) from the pituitary which in turn, stimulate the ovarian theca interstitial cells which is more sensitive to increased LH secretion in PCOS women compared to that of theca cells from healthy women. These theca cells overexpress most steroidogenic enzymes, particularly cytochrome P450c17encoded by CYP17A1 resulting in excessive androgen levels.[6,7] The elevated androgenic hormone level may cause numerous small collections of

soft fluid in the ovaries leading to cyst formation and also changes the regulation of female hormones, resulting in increased estrogenlevels.[5] This hormonal imbalance in PCOS leads to three main conditions, characterized by the presence of menstrual abnormalities (oligomenorrhea or amenorrhea), chronic an ovulation or oligo-ovulation, clinical/biochemical evidence of hyperandrogenism (hirsutism, acne, or androgenic alopecia).[8]

Periodontitis is the sixth most common disease with a prevalence of 11.2% worldwide.[9] It is a deep rooted fact that periodontitis is a chronic low grade inflammatory disease. Literature suggest that the pro-inflammatory mediators in patients with periodontal disease act on the pathophysiological mechanisms involved in the development of many systemic diseases such as diabetes mellitus, cardiovascular diseases, obesity, preeclampsia. Hence, it is the inflammation that links periodontitis with various systemic diseases.[10]

Recently, the association of periodontal diseases with PCOS has been under the spotlight in reproductive endocrinology and periodontology. In PCOS there will be an increased level of androgens and estrogens which in turn affects the local microbiome subgingivally and invariably acts on the gingival cells and change the effectiveness of the epithelium leading to gingivitis and periodontitis. Hence, it is plausible to consider an association with hormonal disorders, such as PCOS that not only is the leading cause of infertility but also shows a reciprocal link with oral health due to its association with inflammation and its metabobolic conditions. Therefore, the aim of the study is to evaluate the periodontal health status among PCOS women by measuring the clinical periodontal parameters.

METHODS

Study population

In this cross-sectional study, a total of 60 women was selected aged 18-45 years old, visiting the Dr. Manu's PCOS Clinic (T-nagar, chennai) during the period of November 2019 to February 2020. Informed consent was obtained prior to the study. The study protocol was approved by the Institutional review board of Ragas Dental College and Hospital, Chennai. Sample size calculation was performed according to study conducted by Rahiminejad et al11, the minimum sample size should be 56 women was calculated using G-power software version 3.1.

All clinical assessments were performed for all 60 women with PCOS. Sufficient information about the study was provided to all participants. A prestructured questionnaire was filled with the demographic details along with history of systemic diseases, antibiotics consumption, pregnancy, periodontal diseases treatment,smoking, and oral health were collected.Participants were divided into following groups: 1) Newly diagnosed PCOS women (n=30)

2).PCOS women under treatment for less than 6months (n=30).

Inclusion criteria and exclusion criteria

Women were selected in the age limit of 18-45 years with PCOS and who give consent to participate were included in the study.

Pregnant women, smokers, individuals with history of alcoholic drinks consumption, malignancy, osteoporosis, thyroid disorders, hyperprolactinemia, those took prophylactic antibiotics for dental procedures, and patients who received PCOS treatment for more than six months and periodontal treatment during the 6-month period before examination were excluded from the study.

Diagnosis of polycystic ovary syndrome

PCOS was diagnosed according to the criteria of Rotterdam20038 with the presence of at least two of the following:(1) polycystic ovaries (presence of >12 follicles in each ovary measuring 2–9 mm in diameter and/or increased ovarian volume >10 ml), (2) oligomenorrhea and/or anovulation and (3) hyperandrogenism (Clinical: Acne, Hirsutism, acanthosisnigrans, Biochemical: Total T >70 ng/dl, Androstenedione >245 ng/dl, DHEA-S >248 μg/dl).

Clinical periodontal parameters

The following clinical periodontal parameters were measured: Gingival Index (GI), Plaque Index (PI), Probing Depth (PD), and Clinical Attachment Loss (CAL) were recorded on each tooth except for the third molar. GI was calculated on all four sites on each tooth using Loe and Silness Index (1963)19, PI was calculated on all four sites on each tooth using Silness and Loe Index (1967)20. According to the classification proposed by the American Academy of Periodontology (1999), PD was calculated in percentages and based on involvement of the gums around the tooth surfaces. The involvement of more than 30% and less than 30% of all surfaces were described as generalized periodontitis and localized periodontitis, respectively. CAL was determined by measuring the distance from the bottom of the periodontal pocket to the cement-enamel junction using a Williams periodontal probe. This index was used for describing the severity of periodontitis (slight: 1-2 mm of CAL; moderate: 3-4 mm of CAL; and severe >5 mm of CAL).

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20.0. The level of significance were all set at $P = 0.05$ (two tailed). The distribution of the data for all groups was analyzed by Kolmogorov-Smirnov test. Following non-normal distribution of the data, Mann-Whitney U test was applied to assess the differences among Group A and Group B for

the clinical periodontal parameters. Chi square test was computed to test the difference within the groups (Group A and Group B).

RESULTS

The total study population comprised 60 divided into 30 newly diagnosed PCOS (PCOS-N) women and 30 PCOS women under treatment (PCOS-MT). All women with PCOS was diagnosed according to the criteria of Rotterdam2003. Among 60 participants, all the study participants were female with a mean age of 29.1±6.6 years (ranging 18-45 years) (Table 1). Intra examiner reliability was checked during the calibration sessions, and reliability was found to be 0.8. Periodontal parameters of both groups are summarized in Table 2. The PCOS-N group had significantly higher GI (2.33±0.606), PI (2.13±0.571), PD (2.4±0.498) and CAL (1.4±0.498) than PCOS-MTand difference between group A and group B were statistically significant.

Table 1: Demographic details.

Number of participants	Mean age
PCOS -N (n=30 females)	29.1±6.6 years
PCOS -MT (n=30 females)	29.1±6.6 years

Table 2: Clinical periodontal parameters of the PCOS-N and PCOS-MT group.

Periodontal parameters	Group	N	Mean±SD	Mean rank	P value
GI	PCOS-N	30	2.33±0.606	41.20	0.00
	PCOSMT	30	1.37±0.49	19.80	
PI	PCOS-N	30	2.13±0.571	40.17	0.00
	PCOSMT	30	1.33±0.479	20.83	
PD	PCOS-N	30	2.4±0.498	41.60	0.00
	PCOSMT	30	1.43±0.504	19.40	
CAL	PCOS-N	30	1.4±0.498	41.60	0.00
	PCOSMT	30	0.43±0.504	19.40	

non-parametric Mann-Whitney U-test was used. PCOS-N:Newly diagnosed Polycystic ovarian syndrome females, PCOS-MT: Polycystic Ovarian Syndrome females under medical treatment, GI: Gingival Index, PI: Plaque Index, PD: Probing Depth, CAL: Clinical Attachment Loss

DISCUSSION

Very few studies are focused on the periodontal parameters in women suffering from PCOS.[12,13] The study is cross-sectional, designed to assess and compare the periodontal health among females newly diagnosed with PCOS, and females receiving medical treatment for PCOS. In this study, the results revealed higher prevalence of periodontititsin newly diagnosed PCOS women comparing to under treatment PCOS women.

The association of gingivitis with hormonal changes during puberty, pregnancy, and menstrual cycles has been studied well.[14] Increased production of steroid hormones is associated with increased gingival inflammation. The effects of estrogen on the gingival epithelium, collagen synthesis, osteoblasts, and bony tissues are important factors in the development of periodontal disease. Estrogen and progesterone affect the capillary system, inflammation, and angiogenesis processes. These alterations lead to excessive proliferation of vascular endothelial cells and epithelial keratinization in gums. The hyperandrogenism status in patients with PCOS not only results in menstrual abnormalities and infertility but also may pose an increased risk of periodontal diseases to these patients. Regarding the conversion of testosterone to estrogen in women with PCOS, the paradox of co-excising of high levels of estrogen and testosterone is appreciable.

The increased vulnerability of PCOS patients to periodontal diseases can be explained regarding the influence of altered circulating hormones in on periodontal tissues. These derangements impact gingival tissues through initiating changes in oral flora and pro-inflammatory cytokines. In turn, these changes adversely affect bones, adhesive joints and eventually lead to tooth loss.[15] Furthermore, enhanced oxidative stress in affected periodontal tissues may participate in the pathology of PCOS by mechanisms such as increasing glucose intolerance and dyslipidemia.[16]

Consistent with previous studies, the higher PI rates in patients with PCOS were compatible with the known impact of hyperandrogenism on vascular flora.[17] Also, the increased CAL in the patients with PCOS patients might be attributed to an increased susceptibility to activation of inflammatory processes. These inflammatory processes play a great role in the development of periodontal disease and involvement of gingival supporting tissues, and subsequent gingival sulcus depth and bone loss.

Also, our study consisted of women who were recently diagnosed and had not received any hormonal or infertility treatment previously. This inclusion factor is critical enough to affect the results of the study. A study by Porwal et al. revealed that the women using oral contraceptive medication suppressing HA had better periodontal

parameters than the untreated PCOS patients18. Therefore, the fact that our study included patients who had not undergone any previous treatment, which would otherwise affect the periodontal parameters, enhances the significance of the study.

Medical treatment for PCOS aims to reduce insulin resistance and systemic inflammation, which in turn improves the clinical and biochemical manifestations of the syndrome. Dursunet al did not consider the medical treatment status of patients; however, medical treatment significantly exerts a role in reduction of systemic inflammation.[12] Therefore, in this study, segregation of the PCOS study population was made according to the status of medical treatment, to evaluate the effect of medical treatment on systemic inflammation along with periodontal status. This study shows higher prevalence of periodontal disease in newly diagnosed females with PCOS comparing to females under treatment.

Justification

In PCOS females, there is an alteration of various hormone levels in the body. Female sex steroid hormones play a key role in periodontal disease progression and periodontal and implant wound healing. Human gingiva has the capacity to metabolize hormones such as estrogen and progesterone. Moreover, gingival tissue exhibits receptors for such hormones and it is considered as a target organ for their direct action. These hormones might act on gingival cells by changing the effectiveness of the epithelial barrier to bacterial injury or by affecting the collagen maintenance and repair.

Limitations

The main limitation of the present study are the relatively small sample size and its cross-sectional design. Additionally, we did not examine the influence of obesity or glucose intolerance on periodontal status in PCOS, because periodontitis is closely linked to obesity and diabetes, severity and extent of periodontitis might be increased in obese or diabetic women with PCOS.

CONCLUSION

Within the limitations of the study the following two conclusions can be drawn: Females with newly diagnosed PCOS had increased PI, GI, CAL and PD compared with females on medical treatment for PCOS. A higher prevalence of periodontitis found in patients newly diagnosed with PCOS may indicate greater likelihood for the development of periodontitis in these patients.

The future assessment of periodontal status in patients with PCOS should focus on different drug therapies, as well as on the duration of treatment and the effect of periodontal therapy on the PCOS population.

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