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Correlation between Polycystic Ovary Syndrome and Periodontal Disease

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Background: Polycystic ovary syndrome has metabolic and reproductive properties that may be associated with periodontitis. The goal of this study was to reassess and offer a comprehensive critical evaluation of all findings associating Polycystic ovarian syndrome (PCOS) and PD, as well as to analyse a possible two - way relationship. The underlying molecular processes of this link are unknown, but chronic inflammation is considered to be a cause. A pro-inflammatory condition was linked to a changed periodontal response in PCOS, which appeared to enhance vulnerability to periodontal disease. Polycystic ovarian syndrome suffers more than half of all females of childbearing age., and has serious consequences for the metabolic, psychological, and cardiovascular systems. Inflammation is a characteristic sign of PCOS. There may be a role for chronic low-grade inflammation as well in metabolic abnormalities. Hence this review aims to correlate the association between PCOS and Periodontal Disease.

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1. INTRODUCTION

Polycystic ovarian syndrome is the most frequent endocrinal disorder among females, mostly affecting the reproductive system. It can have significant negative impacts on metabolic, psychological, and cardiovascular health [1]. It influences approximately 6-8 percent of childbearing age female [2]. Among its risk factors are cardiovascular disease [3], diabetes, dyslipidemia and endothelial dysfunction [4] as well as obesity [5]. Chronic low-grade inflammation characterises this illness [6]. This condition may result in metabolic abnormalities. Several pro-inflammatory cytokines, involving, IL-6, IL-17, and tumour necrosis factor alpha, have been found to be greater in women who have PCOS than in people who have not. Women in their reproductive years are the ones who are most affected. The aetiology and pathogenesis of PCOS are difficult and it encompasses genetics, metabolism, foetal development and environment. Abbott et al reported a genetically determined increase in androgen secretion by the ovaries may lead to the clinical symptoms of PCOS. It could also be linked to a variety of factors, such as a person's financial status, familial background, eating habits, physical activity and behaviour.

Periodontal inflammation is a long-term infection marked by an overactive immune response to harmful germs., that ultimately results in resorption of tooth loss due to lack of alveolar bone [7]. Studies have shown that it is linked with a number of systemic diseases, including diabetes, dyslipidemia, obesity, CVD's, rheumatoid arthritis and respiratory diseases such as asthma and COPD. In general periodontal diseases are mostly caused by microbes such as Porphyromonas gingivalis, Treponema denticola, and other bacteria found in dental plaque, Prevotella intermedia species, etc [8]. Periodontal disease, as well as many other chronic diseases, is thought to be caused by on-going chronic low-grade inflammation [9].

Earlier research reported that both periodontal diseases and PCOS are accompanied by elevated oxidative stress and inflammatory markers [10-12]. There are different mechanisms linking PCOS and Periodontitis for e.g. inflammation, oxidative stress, advanced glycation end products, oral microbiota, hormones, obesity and vitamin-D deficiency [13]. This could point to a shared pathophysiological mechanism in the many forms of these issues. In this current research, we focused to evaluate and identify frequency rates of periodontitis among women suffering from PCOS.

Interleukin-6 and tumour necrosis factor-α, the two proinflammatory cytokines that stimulate CRP production, are also important markers of inflammation. CRP levels are elevated in a variety of systemic disorders, including PCOS, which produces persistent low-grade inflammation that is linked to IR and plays an important role. Patients having high levels of CRP in their blood and other pro-inflammatory disorders like periodontitis may contribute to systemic inflammation which is symptoms of PCOS.

One of most common endocrinal disorder is PCOS, influencing 4-18 percent of female of childbearing age. Periodontal diseases have also been linked to different characteristics of the metabolic syndrome in previous studies. Studying the linked between PCOS and periodontal disease is the goal of this study.

2. POLYCYSTIC OVARY SYNDROME

Preventing, screening, diagnosing and treating illness specific to women is the focus of women's health. PCOS is exceedingly frequent among females of childbearing age, and it is likely to be the most common and severe endocrinopathy. There is growing worry that women suffering from polycystic ovary syndrome may experience metabolic effects due to elevated level of IR that is common in the disease.[14]

3. CLINICAL MANIFESTATIONS

PCOS is a hormonal problem that causes a huge number of females who are of reproductive life. PCOS is characterized by abnormal or long-term menstruating periods, as well as elevated levels of the male hormone androgen. The ovaries may create a significant amount of little concentrations of fluid, rendering them incapable of producing eggs on a routine basis. PCOS commonly manifests clinically at a time of puberty's initial menstruation cycle that can emerge later in life, due to increase in body mass. PCOS was originally documented by Stein

and Leventhal [15] who defined it as a diverse clinical health in the current scientific literature in 1935 with a number of illnesses. Associated with enlargement of the polycystic ovaries on both sides.

According to the Rotterdam ESHRE/ASRM PCOS Consensus Workshop Group, PCOS can be determined if 2 out of 3 measures are available [16]. The Androgen Excess Society, on the other hand, claims that hyperandrogenism is the most important trait, and that its involvement in conjunction with ovaries malfunction (oligoanovulation) is taken into account when diagnosing PCOS [17].

4. AETIOLOGY AND PATHOGENESIS OF PCOS

Even if the precise origin of PCOS is not known, emerging facts indicates that it is a multigenic illness with substantial epigenetic and environmental impacts, including nutrition, financial status, ethnicity and lifestyle variables. According to research, the disease began in the uterine environment, implying the involvement of hereditary elements. The clinical symptoms of PCOS, according to Abbott et al. [18], may arise as a result of ovarian hypersecretion of androgens that is genetically determined. The pathological underpinnings of PCOS, according to King, are aberrant antidiuretic hormone release, a lack in testosterone biosynthesis, and the development of glucose intolerance.

5. THE RELATIONSHIP BETWEEN POLYCYSTIC OVARY SYNDROME AND OTHER SYSTEMIC ILLNESS

5.1 Metabolic Syndrome, IR and Type-II DM

The metabolic syndrome includes a number of disorders, including IR, obesity, hypertension, and hyperlipidemia[19]. In PCOS, the prevalence of IR varies between 50 and 70 percent [20]. Compensatory hyperinsulinemia promotes to elevated range of testosterone in females suffering from PCOS by effectively boosting menstrual testosterone production [21]. In PCOS, IR raises the possibility of type 2 diabetes when it is paired with abdominal obesity [22].

5.2 Cardiovascular Diseases

Those with polycystic ovary syndrome are highly susceptible to develop cardiovascular disease than women without the condition [23,24]. According to Wild et al.'s [25] research, PCOS sufferers seems to be at threat for hypertension. As per wild et al., females having PCOS exhibit low level HDL cholesterol, higher lipid, and low level LDL cholesterol compared to females without PCOS [26].

5.3 Other Comorbidities

Endometrial cancer is frequently seen in women having polycystic ovarian syndrome at all ages, according to findings from a new meta-analysis, although there is no link among PCOS and ovarian or breast cancer [27]. Pregnancy problems, such as miscarriages, gestational diabetes, and preeclampsia, are more likely in females suffering from PCOS [28].

5.4 Association of PCOS with Periodontal Diseases

The mechanisms that link these 2 disease entities aren't totally appreciable, although they do include inflammation in some way. As a result, the scientists looked at the numerous processes that link PCOS to periodontal disease.

6. PATHOGENIC MECHANISMS LINKING POLYCYSTIC OVARY SYNDROME AND PERIODONTITIS

6.1 Inflammation

The key element in the pathophysiology of periodontitis and polycystic ovary syndrome.

Polycystic ovary syndrome is linked to reduced level of inflammatory disease, due to increased levels of C-reactive protein, proinflammatory cytokines and chemokines such a IL18, MCP1, and MIP1, as well as a higher white blood count. In addition, elevated oxidative stress and associated indicators point to PCOS as an inflammatory illness [29]. Periodontal inflammation is a severe inflammatory illness, that connects periodontitis to a variety of systemic ailments [30]. Inflammatory cytokines involving tumour necrosis factor , interleukin 1 (IL1), interleukin 6 (IL6), leptin, adiponectin, and resistin, as well as signalling pathways like relate reduced level of inflammatory disease to glucose intolerance is one of the most common symptoms of polycystic ovarian syndrome.

CRP is a key inflammatory measure that is triggered by proinflammatory cytokines like IL6

and TNF. CRP levels are elevated in a variety of systemic disorders, involving PCOS, which is linked to reduced level of severe inflammation, which is associated with glucose intolerance, it is very important in the growth of the syndrome, as well as hyperin sulinemia [31,32]. In chronic infections like periodontitis, C-reactive protien levels in the blood and various inflammatory factors can promote chronic inflammatory markers, which can contribute to glucose intolerance, a polycystic ovary syndrome symptom. IL-6, is the hormone-regulated and promotes the hypothalamic–pituitary–adrenal axis under chronic stress. Elevated IL-6 are linked to increased body weight and glucose intolerance, both are features of the polycystic ovary syndrome [33]. Similarly in patients with periodontitis, higher amounts of hallmarks of inflammation like as C-reactive protiens an have been identified in gingival tissue and GCF [34,35]. White blood cell concentration is also a measure of reduced level of inflammatory disease .It's been connected to a variety of chronic inflammatory conditions that last a long time. Orio et al [36]. discovered that females with PCOS seemed to have an increased wbc number, an indication of reduced level of inflammatory disease and CVD events, compared to age and BMI-matched individuals in a retrospective study.

6.2 Oxidative Stress

Inflammation and oxidative stress are pathophysiological processes that are intimately associated. Chronic periodontitis and PCOS individuals have oxidative stress indicators detected in their blood. GCF myeloperoxidase levels were raised among females suffering from PCOS, but serum NO levels were unaffected, indicating peroxidation at the periodontal level. Gingival inflammation is a common feature in females suffering from polycystic ovary syndrome, and periodontal level seems to be impacted in polycycstic ovary syndrome, according to the findings.

6.3 Advanced Glycation End Products

Peroxidation cause chronic female's microvascular insufficiency suffering from polycystic ovary syndrome, resulting in the production of IR and AGE [37]. Periodontal disease progresses and becomes more severe as a result of AGE products. The fragile nature of periodontal tissues makes them susceptible to products resulting from oxidative stress due to high expression of RAGE (Receptor -AGE) [38].

Table 1. Literature review

Author (Year)	Aim	Findings
Aliye Akcali et al (2014)	To test the experiment that in PCOS, the concentrations of potential microbial infections in saliva and host immune response in sera are higher than in healthy people.	This hormonal condition amplifies the favourable relationship amongst oral bacteria and gingivitis.
Ozgun Ozcaka et al (2013)	To correlate the concentrations of IL-17, IL-17F, IL-17A/F, and IL-17E in GCF, saliva, and sera of non-obese women having PCOS to their well being.	In non-obese women having PCOS, IL-17 concentrations are changed, which may affect gingivitis.
Nagihan Bostanci et al (2017)	To analyze saliva and sera concentrations of MMP, myeloperoxidase, and neutrophil elastase in PCOS suspected individuals with systemic condition.	As indicated by saliva and sera concentrations of neutrophilic enzymes, PCOS and gingivitis are linked.
Cecilia Fabiana et al (2020)	The goal of this research aimed to see if there was a correlation among periodontal condition, gingivitis, and chronic periodontitis, and polycystic ovary syndrome.	PCOS individuals tend to be more prone to periodontitis than individuals who do not have the condition.

6.4 Oral Microbiota

Hormonal alterations in polycystic ovary syndrome might impact saliva concentrations of possible microbial infections and/or underlying circulating levels of antibodies, especially in the case of gingival inflammation. The accumulation of circulating gonadotropin - releasing hormone in periodontium could be used to illustrate this, that supplies the bacteria with the resources they need to thrive [39,40]. Microbial pathogens' lipopolysaccharides in plaque beneath the gums have the potential to cause substantial quantities of IL1 and TNF to be produced [41], and this continuous elevation of cytokines exacerbates the IR that is hallmark of PCOS.

6.5 Hormones as Pathophysiological Link

The amount of various hormones in the blood of PCOS females change. In the course of periodontal condition and the repair of periodontal and implant wounds, female sex steroid hormones are important factors [42]. Hormones like estrogen and progesterone can be metabolized by human gingiva. Furthermore, gingiva has hormone receptors and is designated a susceptible tissue for direct hormone action [43]. These hormones may affect gingival cells by changing the efficiency of the epithelial barrier to bacterial damage, as well as collagen maintenance and repair [44].

7. CONCLUSION

Through several pathophysiological linkages, including as reduced level of inflammation, glucose intolerance, advanced glycation end products, and hormonal levels, we can speculate that PCOS may aggravate the periodontal disease established by plaque. Evidence suggests that periodontal disease produces persistent systemic inflammation, which leads to IR and, in turn, type- 2 DM, which is a common symptom of polycystic ovarian syndrome. As a result, it can be assumed that PCOS and periodontal diseases have a bidirectional link.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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