

ORIGINAL

A Comprehensive Analysis of the Relationship Between Polycystic Ovary Syndrome and Anxiety

Análisis exhaustivo de la relación entre el síndrome de ovario poliquístico y la ansiedad

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ABSTRACT

Introduction: polycystic Ovary Syndrome (PCOS) is a reproductive, metabolic, and psychiatric endocrine disorder. The increasing evidence points toward the firm relationship between PCOS and anxiety but does not identify the underlying relationships.

Objective: to investigate the relationship between PCOS and anxiety, evaluating potential causative factors including hormonal deregulation, metabolic imbalance, and markers of inflammation.

Method: the research involved 250 women participants were recruited, 150 with PCOS (experimental group) and 100 controls. Anxiety was measured by a validated questionnaire for anxiety. Hormonal and metabolic variables, such as insulin resistance (HOMA-IR), testosterone, BMI, and C-reactive protein (CRP), were measured and correlated with anxiety scores. Statistical tests were utilized to establish significant differences and correlations.

Results: the evidence favours hormonal dysregulation, metabolic derangement, and systemic inflammation as the etiopathogenic factors in anxiety in PCOS patients. Hyperandrogenism and insulin resistance are associated with neuro-chemical alterations in mood control, while systemic inflammation is associated with increased psychological distress. These physiological changes could be the intrinsic factors for increased incidence of anxiety in PCOS.

Conclusion: the research identifies a high level of correlation between PCOS and anxiety, with insulin resistance, elevated testosterone, BMI, and inflammation being significant contributory factors. Intervention in these variables is helpful in improving mental health outcomes among PCOS patients. Longitudinal trends and possible therapeutic options for decreasing anxiety in this group should be the focus of future studies.

Keywords: Polycystic Ovarian Syndrome; Anxiety Disorders; Hormonal Imbalance; Metabolic Dysfunction; Inflammation and Mental Health.

RESUMEN

Introducción: el síndrome de ovario poliquístico (SOP) es un trastorno endocrino reproductivo, metabólico y psiquiátrico. Las crecientes evidencias apuntan hacia la firme relación entre el SOP y la ansiedad, pero no identifican las relaciones subyacentes.

Objetivo: investigar la relación entre el SOP y la ansiedad, evaluando los posibles factores causales, como la disregulación hormonal, el desequilibrio metabólico y los marcadores de inflamación.

Método: en la investigación participaron 250 mujeres, 150 con SOP (grupo experimental) y 100 controles. La ansiedad se midió mediante un cuestionario validado para la ansiedad. Se midieron variables hormonales y metabólicas, como la resistencia a la insulina (HOMA-IR), la testosterona, el IMC y la proteína C reactiva (PCR), y se correlacionaron con las puntuaciones de ansiedad. Se utilizaron pruebas estadísticas para establecer diferencias y correlaciones significativas.

Resultados: las pruebas favorecen la desregulación hormonal, la alteración metabólica y la inflamación sistémica como factores etiopatogénicos de la ansiedad en pacientes con SOP. El hiperandrogenismo y la resistencia a la insulina se asocian a alteraciones neuroquímicas en el control del estado de ánimo, mientras que la inflamación sistémica se asocia a un aumento de la angustia psicológica. Estos cambios fisiológicos podrían ser los factores intrínsecos del aumento de la incidencia de la ansiedad en el SOP.

Conclusión: la investigación identifica un alto nivel de correlación entre el SOP y la ansiedad, con resistencia a la insulina, testosterona elevada, IMC e inflamación como factores contribuyentes significativos. La intervención en estas variables es útil para mejorar los resultados de salud mental entre las pacientes con SOP. Las tendencias longitudinales y las posibles opciones terapéuticas para disminuir la ansiedad en este grupo deberían ser el objetivo de futuros estudios.

Palabras clave: Síndrome de Ovario Poliquístico; Trastornos de Ansiedad; Desequilibrio Hormonal; Disfunción Metabólica; Inflamación y Salud Mental.

INTRODUCTION

Polycystic ovarian syndrome (PCOS), endocrinopathic instability, is prevalent among women in the age of reproduction spectrum. The incidence of this condition, which is among the most pervasive endocrine ailment globally, is different from 2,2 percent to 26,7 % compared to the primary goal of this investigation is to determine the frequency of symptoms associated to sadness and anxiety in PCOS-positive women that have reached reproductive age.⁽¹⁾ The primary goal is to determine the incidence of depressed and anxious symptoms in PCOS-positive women who are ready to become mothers. In addition, because these variables have an essential effect on someone's psychological health it sought for an understanding of the relationship between various economic variables including relationships quantity symptoms related to anxiety and depression. Additionally, the disease's symptoms, such as fuzzy, acne, and other symptoms, can make sufferers feel less attractive and feminine. Reducing the sensation of contentment physically and mentally in addition to lowering their sense of confidence.⁽²⁾ This refers to a unique sickness that affects several systems and organs and exhibits an abnormally wide range of clinical manifestation. The investigation was to contrast healthy women with PCOS to each other regarding the extent and severity of anxiety, including depressive symptoms, ego-resiliency, and stress management strategies, in addition to any potential socio-demographic influences on these factors.⁽³⁾ A separate goal was to assess the associations between PCOS-affected that women's emotional resilience and stress-coping strategies and their levels increased depressive and anxiety symptoms. This consists of hyperandrogenism, adulatory disappointment, and polycystic abnormalities in the ovary. PCOS is the most prevalent endocrinology condition in women of reproductive age and affects premenopausal women.⁽⁴⁾ Individuals have been separated into the group receiving acupuncture or deliberately the untreated group utilizing impermeable packages and generated by computers randomized systems. The primary goal of this investigation is to determine the incidence of depressed and anxious symptoms in PCOS-positive women who are ready to become mothers. In addition, because these variables have an essential effect on someone's psychological health it sought for an understanding of the relationship between various economic variables including relationships quantity to anxiety and depression.

The fundamental hormonal abnormalities that cause menstrual cycle disruptions and fertilization malfunction cause PCOS. Along with these signs, conventional clinical manifestations indicate PCOS additionally involves abdominal ultrasound evidence of polycystic ovarian structure and clinical or laboratory evidence of increased testosterone.⁽⁵⁾ The adoption of adequate suggestions for periodic assessments and subsequently prompt therapy should be made possible by this scientific manufacturing which additionally has a positive effect on the health and monetary expenses related to anxieties and depression. This research intended to evaluate PCOS patients' anxiety and depressive symptoms and their connections to various economic factors.

Research the findings of this investigation demonstrate that depression, anxiousness, and stress affect teenagers with PCOS' quality of life.⁽⁶⁾ Based on our results, we underline the need for interventional research and recommendations for enhancing all facets of quality of life and reducing the psychological toll PCOS takes on adolescence during this development. The goal of was to analysis of the present investigation revealed that compared to the healthy control women, PCOS patients dramatically underperformed on measures of verbal proficiency consideration or visual-spatial competence.⁽⁷⁾ The objective of was to ensure the respondents of each country had substantial reductions in their depressive and anxiety average scores due to the polycystic ovarian syndrome executed by professional pharmacy technicians.⁽⁸⁾ Research in decision contrasted to the

placebo group, most PCOS patients experienced distress, hopelessness, and anxiety.⁽⁹⁾ By attending to the psychological needs of PCOS women, their standard of existence can be improved and enhanced. The goal of was also based on population research, which includes parents at high risk, postpartum depression, and symptoms related to clinical polycystic ovary syndrome.⁽¹⁰⁾ Research additionally, when researching the impacts of PCOS on psychological health, biochemical indicators of excess testosterone can be equally effective as its physical manifestations, and elevated levels of these indicators could also impact the state of mind.⁽¹¹⁾ The objective of was to PCOS women are particularly susceptible to psychological problems as healthy individuals.⁽¹²⁾ This compound stands out among the many therapies as an effective method operating as the first-line medication in PCOS for physiological improvement, possibly exerting impacts on psychiatry along with patients.⁽¹³⁾ The goal of was to go along the letrozole and medication paradigm in which PCOS-afflicted creatures demonstrated deterioration in cognitive performance.⁽¹⁴⁾ More research can be performed to discover the precise processes causing these alterations and potential solutions for reversing effects.^(15,16) There was a change in anxiety, individuality, and psychological elements comparing patients with PCOS and healthy comparisons. The outcomes of our investigations emphasize the value of an integrated strategy in the care of PCOS women. Research Psychological problems usually appear in teenagers having PCOS. Therapists need to be aware of the high risk of serious psychological disorders in adolescents with polycystic ovary syndrome.

METHOD

The PCOS is a frequent endocrine illness involving metabolic, reproductive, and mental health. According to research, there exists a close connection between PCOS and anxiety; however, mechanisms for this condition remain unknown. In this investigation, the extent to which imbalances in hormones, insulin resistance, and inflammation biomarkers help contribute to PCOS-related anxiety is examined. Based on analyses of the crucial physiological and psychological markers, potential pathways between metabolic illness and psychiatric wellness are envisioned. Recognizing this connection can assist in the creation of improved strategies for addressing both the physical and psychological symptoms of PCOS.

Participants

The research investigated 250 women to examine the correlation between PCOS and anxiety. The participants were evaluated on a standardized scale of anxiety, and primary hormonal, metabolic, and inflammatory indicators were quantified. The investigation required to establish possible correlations between hormonal imbalance, insulin resistance, and inflammation and symptoms of anxiety.

Classification of groups

It examines the connections between hormonal disruptions, metabolism and feelings. It aims to investigate the extent to which physiological change influences mental well-being and general quality of life. The research is structured to measure various biological and psychological parameters to follow their correlation with emotional well-being. The research subjects with varying physiological characteristics to establish important patterns and cause processes behind physical health and mental well-being. The research contributes to information and management of mental well-being and its linkage to physical wellbeing.

Experimental Group

This population included 150 patients of PCOS on clinical and diagnostic grounds. Hormonal disturbance, metabolic change, and mental status were assessed in all the patients in a bid to examine if there exists any relationship between PCOS and symptoms of anxiety. Physiologic markers including the level of testosterone, insulin resistance (HOMA-IR), body mass index (BMI), and inflammatory markers C-reactive protein (CRP) were also noted. Psychosocial evaluation was provided and to assess the level of emotional disturbance and anxiety in PCOS patients. Data collection sought to confirm the role of hormonal and metabolic disturbance leading to psychological distress.

Control Group

This cohort consisted of 100 women with PCOS, but these women had less severe symptoms and less serious metabolic disturbances. They were administered comparable assessments, which acted as a control group and aided in evaluation relative to the other group, to determine whether differences related to PCOS severity or effects to symptoms could affect anxiety scores and metabolic variability. Comparison of both groups provided essential insight into the range of psychological variance and/or physiological concern to be derived from PCOS.

Hormonal and Metabolic Factors in PCOS

PCOS is characterized by hormonal and metabolic abnormalities that result in a range of physiological and psychological complications. One of the most important hormonal abnormalities in PCOS is hyperandrogenism, leading to increased levels of testosterone and manifesting as features of irregular menstrual cycles,

hirsutism, and acne, to mention a few. One of the most prevalent metabolic abnormalities in PCOS is insulin resistance, leading to hyperinsulinemia and insulin resistance, thereby predisposing to type 2 diabetes. Metabolic derangement is very associated with obesity and weight gain, which subsequently lead to hormonal derangements. Chronic systemic inflammation and elevated CRP are also associated with PCOS and can affect mood-related disorders like depression and anxiety. The confluence of hormonal dysregulation, metabolic derangement, and inflammatory markers can be implicated in exacerbating psychological distress in patients with PCOS. These are key considerations in the course of establishing targeted interventions to manage the physical and mental health manifestations of patients with PCOS.

Psychological Impact of PCOS

PCOS does have an impact on mental health and results in heightened anxiety and emotional distress. Hormonal imbalance, insulin resistance, and weight gain and abnormal cycle symptoms result in mood disturbance. Fertility issues and elevated androgens both result in stress and anxiety. Body image disturbance and social stigma are responsible for the psychological distress and make a person with PCOS susceptible to anxiety disorders.

RESULTS

PCOS has also been linked with higher levels of anxiety following hormonal, metabolic, and psychological alterations. Metabolic dysfunction and heightened stress behind anxiety symptoms are caused by insulin resistance.

Comparison of Anxiety Scores and Hormonal/Metabolic Parameters

PCOS is typified by the extensive changes in psychological, endocrine, and metabolic parameters. PCOS females are more susceptible to have high anxiety levels than non-PCOS females, suggesting an integral connection between endocrine disturbance and psychiatry. Hyperinsulinemia and insulin resistance are among the most relevant metabolic disturbances of PCOS, and they have been implicated to be involved in both physiological as well as psychological dysfunctions. Greater insulin resistance has the potential to cause metabolic comorbidities, and also has the secondary effect of exacerbating symptoms of anxiety. Endocrine dysfunction, with raised levels of androgens, is common in PCOS women. Hyperandrogenism, or hyperandrogenemia, or elevated testosterone levels, has been associated with mood and anxiety disturbances, hence indicating the psychological effect of PCOS. Chronic low-grade inflammation has been recognized as a mediating factor of metabolic disorder and mental status, and is capable of amplifying symptoms of anxiety in PCOS women. These co-related variables should be understood with a view to creating effective intervention strategies that enhance the psychological, as well as physiological, welfare of PCOS patients. Comparison of Anxiety Scores and Hormonal/Metabolic Parameters is highlighted in table 1.

Table 1. Comparison of Anxiety Scores and Hormonal/Metabolic Parameters

Parameter	Experimental Group (PCOS,n=150)	Control Group (n=100)	P-Value
Mean Anxiety Score (\pm SD)	18,6 \pm 4,2	12,3 \pm 3,8	<0,01
Insulin Resistance (HOMA-IR)	3,2 \pm 1,1	1,8 \pm 0,7	<0,01
Testosterone (ng/dl)	65,4 \pm 10,2	32,1 \pm 7,8	<0,01
BMI (kg/m ²)	28,7 \pm 3,6	24,5 \pm 3,1	<0,01
Inflammatory Marker (CRP,mp/L)	5,2 \pm 1,4	2,1 \pm 1,0	<0,01

Correlation between anxiety and hormonal/metabolic factors

Anxiety in PCOS has a strong correlation with many endocrine and metabolic abnormalities. A central role of insulin resistance, which affects the metabolism of glucose and contributes to mood disorders, is a fundamental factor for such a correlation. In case of uncontrolled insulin, this is associated with mechanisms of stress and hence increases anxiety. Also, this metabolic disturbance exacerbates the endocrine disorder, which itself impinges upon both physical and emotional consequences in a cycle of reciprocity. Also, raised concentrations of androgens, most commonly testosterone, are seen with PCOS and have been related to lability of mood and stress responsiveness. Hormonal changes can modify neurotransmitter function, influencing emotional processing and leading to heightened anxiety. Also, body mass index (BMI) reflects another factor to highlight when highlighting the connection between anxiety and PCOS those with higher BMI are probably going through more metabolic stress that influences psychological well-being from a less direct perspective. Overweight has also been linked to emotional and social distress, which can contribute to increased symptoms of anxiety. Another major contributing factor of anxiety with respect to PCOS is chronic low-grade inflammation, as indicated by

increased inflammatory markers. Inflammatory markers have been linked to the inhibition of neural circuits related to stress regulation, which can indicate an altered level of anxiety. In addition, menstrual disturbances in PCOS can cause further emotional distress because of irregular cycles and reproductive health concerns, contributing to anxiety. Management of these interrelated factors is crucial to enhancing mental health in PCOS patients. Table 2 shows the Correlation between anxiety and hormonal/metabolic factors.

Parameter	Correlation coefficient	P-Value
Insulin Resistance (HOMA-IR)	0,42	<0,01
Testosterone Levels (ng/dL)	0,38	<0,01
BMI (kg/m ²)vs. Anxiety Score	0,35	<0,01
CRP (mg/L)vs. Anxiety Score	0,40	<0,01
Menstrual Irregularity Score	0,45	<0,01

Distribution of Anxiety Severity Levels

The pattern of anxiety severity is distinctly different between individuals with PCOS and those without. There is a significant percentage of people with PCOS who have moderate to severe anxiety, which speaks to the higher psychological burden represented by these individuals. The higher frequency of overall severe anxiety suggests that the hormonal and metabolic problems present in PCOS have an additive effect on stress and emotional distress. Insulin resistance, androgen increase, and chronic inflammation can help account for the potential aggravation of anxiety symptoms. In contrast, the individuals without PCOS have lower anxiety symptoms with a greater percentage of minimal to mild anxiety symptoms as compared to the individuals with PCOS. This discrepancy points to the possible extent of endocrine and metabolic dysfunction impacting mental well-being in the women with PCOS. Additionally, the uncertainty of menstrual cycles, body image concerns, and fertility stress could easily exacerbate anxiety symptoms in women with PCOS. Increased social expectations, emotional distress surrounding their PCOS symptoms, and social functioning could also add to psychological stress. These findings illustrate the need for targeted psychological and medical treatment of anxiety symptoms in patients with PCOS. Multidisciplinary management approaches, such as hormonal control, lifestyle changes, and mental health counseling, can be crucial in decreasing anxiety levels and enhancing overall well-being. Table 3 and figure 1 depict the Distribution of Anxiety Severity Levels.

Anxiety Severity Level	Experimental Group (PCOS, n=150)	Control Group (n=100)	P-Value
Minimal (Score ≤ 9)	18 (12 %)	45 (45 %)	<0,01
Mild (Score 10-14)	32 (21,3 %)	35 (35 %)	<0,01
Moderate (Score 15-19)	54 (36 %)	15 (15 %)	<0,01
Severe (Score 20-24)	46 (30,7 %)	5 (5 %)	<0,01

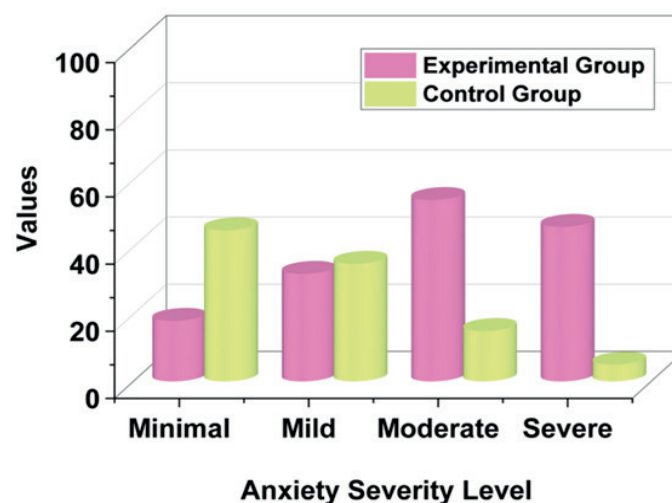


Figure 1. Presentation of Distribution of Anxiety Severity Levels

DISCUSSION

The goals of this investigation are to quantify the extent to which people with PCOS have depression and anxiousness and then to evaluate the potential impact of socio-demographic characteristics on this extent. Above a third of PCOS-affected women possessed intermediate to profound feelings of anxiety, with 18 % and 6 %, respectively. It has been speculated that this could be due to the fact as their worry is subsequent in personality instead of main to their disease.⁽¹⁷⁾ The pressure remained the most typical anxious symptom though discomfort is the least distinctive. The poor confidence, along with diminished optimism imposed through physical symptoms of PCOS that include pimples and being overweight, and the condition can help explain precisely why most PCOS women suffer from anxiety. Individuals can additionally be concerned about their potential infertility or suffer anxiety.⁽¹⁸⁾ The present research investigated a connection between various socioeconomic characteristics and anxiety symptoms, revealing that unmarried women experienced more significant symptoms than their spouses. Research promoting the hypothesis suggests that PCOS symptoms, including being overweight, hirsuteness, and irregular menstruation, can position women under stress compared to diminished self-worth, unfavourable perceptions of themselves, worry about future complications, and the shortage of satisfaction in romantic relationships.⁽¹⁹⁾ A previous research across the West revealed that being single increased the risk of developing anxiety because of the associated stresses of being alone and without a reliable source of financial or social support. Patient evaluations revealed tension and worry were the most often reported forms of anxiety, especially among single women. Researchers postulate that the patient's dread of social phobia and isolation can result from society's unfavourable response to their appearance, including android obesity problems with acne and manly hair on the physique.⁽²⁰⁾ In addition to unemployment, poor income constituted a strong socioeconomic predictor of anxiety symptoms in this sample. Financial and economic challenges can arise from the absence having revenue sources that can have a detrimental effect on the unemployed person. The inability to provide for one's financial commitments is stressful enough, but being unemployed can also occasion feelings well worthlessness and identity crisis as working offers opportunities for regular social engagement and the advancement in social status that contributes to one's perceived personality.⁽²¹⁾ Most challenges with the analysis occurred because it consisted of a cross-sectional research. It prevented an extensive evaluation of PCOS and its potential psychological consequences. Additionally, its absence of psychological interaction alongside using questionnaires as a part of the research design resulted in findings that could only be understood regarding anxiety and depression symptoms. This was because of response bias, selection bias, and the use of diagnostic instruments.

CONCLUSIONS

The results suggest that PCOS is highly linked with increased levels of anxiety, which are greatly affected by hormonal and metabolic dysregulation. The interaction between insulin resistance, hyperandrogenism, high inflammatory markers, and high BMI is important in aggravating psychological distress in patients with PCOS. The findings emphasize the need to treat both physiological and psychological aspects of the disorder to develop effective management plans. With the worsening of the symptoms of anxiety by metabolic dysfunctions like insulin resistance and chronic inflammation, early intervention into the control of metabolism can bring positive impacts to the mental health status. Even the prevalence of different levels of severity of anxiety underlines the extreme psychological impact made by PCOS on its subjects. Increased levels of moderate to severe anxiety among the PCOS patients compared to the control subjects are a testament to the effects of the endocrine dysfunctions on emotional status. The ambiguity regarding menstrual irregularity, infertility and negative body image serves to increase psychological distress. These results justify implementing a multidisciplinary treatment protocol with lifestyle modifications, hormonal therapy, and psychotherapy to protect against anxiety and improve the global quality of life in PCOS women.

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