Chapter 7
Polycystic Ovary Syndrome PCOS and Depression Role of Neuroinflammation

Mohammad Reza Ramezanpour
Pediatric Urology and Regenerative Medicine Research Center, Gene, Cell, and Tissue Research Institute, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran

Omid Bahrami
Pediatric Urology and Regenerative Medicine Research Center, Gene, Cell, and Tissue Research Institute, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran

Muhammad Parsa Pashazadeh
Pediatric Urology and Regenerative Medicine Research Center, Gene, Cell, and Tissue Research Institute, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran

Rojin Sarallah
Islamic Azad University Medical Branch of Tehran, Tehran, Iran

Reza Nikfar
Pediatric Urology and Regenerative Medicine Research Center, Gene, Cell, and Tissue Research Institute, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran

Masoumeh Majidi Zolbin
https://orcid.org/0000-0002-1351-8955
Iranian Tissue Bank and Research Center, Tehran University of Medical Sciences, Tehran, Iran

DOI: 10.4018/979-8-3693-5908-2.ch007

ABSTRACT

Polycystic ovary syndrome (PCOS) is a multidimensional condition with metabolic, hormonal, and neuropsychiatric effects. Depression is common among PCOS patients, and emerging research shows neuroinflammation as a probable reason. Chronic low-grade inflammation, insulin resistance, hyperandrogenism, and gut dysbiosis all contribute to neuroinflammatory processes, which result in hypothalamic dysfunction, neurotransmitter imbalances, and hypothalamic-pituitary-adrenal (HPA) axis dysregulation. Abnormal microglial activation and oxidative stress may further damage neuroplasticity, interfering with proper mood regulation. This chapter investigates how neuroinflammatory pathways influence the relationship between PCOS and depression, focusing on their effects on brain function and mood regulation. This chapter addresses neuroinflammation as a mechanism contributing to psychiatric symptoms in PCOS by identifying key inflammatory drivers, as well as prospective treatment targets.

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a common condition that affects between 4% and 20% of women during their reproductive years (Deswal et al., 2020). Although genetic factors, particularly genes linked to ovarian and adrenal hormone production, like those in the CYP family, contribute to PCOS, environmental influences also play a major role in how the condition develops and progresses. Environmental toxins, such as endocrine-disrupting chemicals (EDCs) like bisphenol A (BPA) and advanced glycation end-products (AGEs), may aid in the development and exacerbation of PCOS by disrupting hormonal and metabolic balance, especially when exposure occurs during critical developmental periods (Rutkowska & Diamanti-Kandarakis, 2016). When combined with genetic susceptibility, environmental factors can worsen the metabolic and hormonal imbalances commonly seen in PCOS-affected individuals.

The genetic and environmental metabolic impairments underlying PCOS primarily drive the condition through functional ovarian hyperandrogenism, characterized by dysregulated androgen secretion. This dysfunction is associated with the overexpression of steroidogenic enzymes, particularly cytochrome P450c17, in ovarian theca cells. Insulin resistance and obesity deteriorate hyperandrogenism through increasing ovarian sensitivity to luteinizing hormone (LH) (Rosenfield & Ehrmann, 2016). These disruptions cause diverse physical and psychological symptoms.

PCOS symptoms include menstruation abnormalities, weight gain, exhaustion, hirsutism, thinning hair, infertility, acne, mood changes, pelvic discomfort, and sleep difficulties, with depression being one of the most often reported psychological