

## Exploring the Link Between Hormonal Markers and Sexual Behavior in Female Infertility

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### Abstract:

**Background:** This study explores the intricate relationship between hormonal markers and sexual behavior in the context of female infertility. Hormonal imbalances, often a root cause of infertility, can significantly influence sexual desire, arousal, and overall sexual health. By examining key hormonal markers such as estrogen, progesterone, and luteinizing hormone, this research aims to elucidate their impact on sexual behavior patterns in infertile women. Through a comprehensive review of existing literature and analysis of clinical data, we identify how these hormonal fluctuations correlate with changes in sexual activity and libido. Understanding this connection is crucial for developing holistic treatment approaches that address both the reproductive and sexual well-being of affected women. This study underscores the importance of considering sexual health in the management of infertility and calls for integrated care strategies that encompass both endocrinological and psychological aspects of female reproductive health.

**Material and Method:** A case-control study with a clinical focus was conducted at the Department of Obstetrics and Gynecology. The study included 200 female participants, divided into two groups: 100 infertile patients and 100 fertile controls. The participants were matched for age to ensure comparability between the groups.

**Results:** The data indicated an altered antioxidant/oxidant ratio and an increase in free radical status (ROS/RNS), signifying a shift in the cellular oxido-redox state. The endocrine profiles of gonadotropins (LH/FSH) and ovarian hormones (estradiol, testosterone, and progesterone) showed significant alterations in patients with PCOS, endometriosis, OI, and BOH, suggesting modifications in the hypothalamic-pituitary-ovarian (HPO) axis. Additionally, gynecological events such as irregular menstruation, uterine fibroids, and structural issues with the uterus and oviduct, including stillbirth and miscarriage, were observed in patients with BOH.

**Conclusion:** The impact of medicalization on Indian women's values is multifaceted. While some women have successfully managed their infertility issues, others have been significantly affected by infertility treatments and assisted reproductive technologies (ART). The researcher's work on reproductive diseases associated with infertility in Indian women is highly significant within the realm of biomedical sciences. In addition, affected cases in India receive genetic testing and counseling, as well as therapy and management of these issues through the use of ART.

**Keywords:** Female infertility, Hormonal markers, Sexual behavior, Oxidative stress, Polycystic Ovary Syndrome (PCOS), Endometriosis and Ovulatory Infertility (OI).

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### Introduction

Infertility is a complex and multifaceted issue that affects millions of women worldwide, with significant physical, emotional, and social implications. In India, the medicalization of infertility has introduced advanced diagnostic and therapeutic techniques that have transformed the landscape of reproductive health. The utilization of assisted reproductive technologies (ART) and other medical interventions has enabled many women to address and manage their infertility issues. However, the impact of these treatments extends beyond the

physiological, influencing the psychological well-being and societal values of Indian women.[1] The interplay between hormonal markers and sexual behavior in the context of female infertility is an area of growing interest within the biomedical sciences. Hormonal imbalances are often at the core of reproductive disorders such as Polycystic Ovary Syndrome (PCOS), endometriosis, ovulatory infertility (OI), and conditions leading to a bad obstetric history (BOH). These disorders not only disrupt the normal functioning of the hypothalamic-pituitary-

ovarian (HPO) axis but also significantly affect sexual desire, arousal, and overall sexual health. Understanding the correlation between hormonal markers and sexual behavior is crucial for developing holistic treatment approaches that address both reproductive and sexual health.[2] In India, the traditional societal expectations and cultural values surrounding motherhood and female sexuality add another layer of complexity to the experience of infertility. Women often face intense pressure to conceive and bear children, which can exacerbate the emotional distress associated with infertility. The introduction of ART and other medical treatments offers hope but also brings challenges, including the psychological burden of undergoing rigorous medical procedures and the potential stigma attached to using such technologies.[3]

This study aims to explore the relationship between hormonal markers and sexual behavior in infertile women, with a particular focus on oxidative stress indicators and endocrine profiles. Oxidative stress, a condition characterized by an imbalance between free radicals and antioxidants in the body, has been implicated in various reproductive disorders.

By examining markers such as total proteins, lipid peroxides (LPO), and superoxide dismutase (SOD), this research seeks to elucidate the role of oxidative stress in infertility. Additionally, the study investigates the levels of ovarian hormones (estradiol, testosterone, and progesterone) and protein hormones (FSH and LH) to understand their impact on sexual behavior and reproductive health.[4,5]

The significance of this research lies in its potential to provide a deeper understanding of the biochemical and hormonal underpinnings of infertility and their influence on sexual behavior. Such insights can inform the development of comprehensive treatment strategies that integrate both medical and psychological support, ultimately improving the quality of life for affected women. Moreover, the study highlights the importance of genetic testing and counseling in managing infertility, offering a personalized approach to treatment.[6]

Examining the endocrine profiles, biochemical stress factors, age, and other clinical features in various reproductive disorders affecting women in India is crucial, particularly in light of the previously mentioned data. These indices are essential for understanding infertile cases in the region, which include conditions such as endometriosis, PCOS, BOH, and gonadal dysgenesis (ovarian insufficiency).

### Material and Methods

A case-control study with a clinical focus was conducted at the Department of Obstetrics and Gynecology.

The study included 200 female participants, divided into two groups: 100 infertile patients and 100 fertile controls. The participants were matched for age to ensure comparability between the groups.

### Selection of Participants

#### 1. Infertile Group (n=100)

- Polycystic Ovary Syndrome (PCOS): 28 patients
- Endometriosis: 22 patients
- Ovulatory Infertility (OI): 30 patients
- Bad Obstetric History (BOH): 20 patients

#### 2. Control Group (n=100)

- Fertile females with no history of infertility

### Inclusion Criteria

- Infertile women aged 20-40 years
- Diagnosis of infertility confirmed by clinical and laboratory assessments
- Fertile controls with at least one child and no history of infertility

### Exclusion Criteria

- Women with systemic diseases, chronic infections, or on long-term medication affecting reproductive health
- Patients with incomplete medical records

### Statistical Analysis

Data were analyzed using appropriate statistical methods to compare oxidative stress markers and hormone levels between the infertile and control groups. The results were expressed as mean  $\pm$  standard deviation (SD). Statistical significance was determined using the Student's t-test for normally distributed variables and the Mann-Whitney U test for non-normally distributed variables. A p-value of  $<0.05$  was considered statistically significant.

### Result

The study involved 100 infertile individuals matched in age with 100 healthy controls. The infertile group comprised individuals affected by conditions such as endometriosis, bad obstetric history (BOH), ovarian insufficiency (OI), or polycystic ovarian syndrome (PCOS). Prior to participation, informed consent was obtained from all infertile participants. Comprehensive data including demographic information, personal history (age, age at marriage, menstrual cycle details, number of children), and family medical history were meticulously recorded. Subsequently, blood samples were collected and subjected to biochemical analyses.

**Table 1: Anti stress indices in control and study groups**

Parameters	Study Groups				
	Control (n=100)	PCOS (n=28)	Endometriosis (n=22)	BOH (n=20)	OI (n=30)
LPO (nmol/ml)	3.78±0.38	6.45±0.29	6.05±0.41	5.87±0.84	6.04±0.54
SOD activity (U/mg protein)	1.89±0.29	3.55±0.27	5.10±0.31	4.65±0.28	2.55±0.16
Protein levels (mg/100µl)	0.38±0.21	0.51±0.07	0.43±0.05	0.38±0.04	0.42±0.06

Table 1 presents the anti-stress indices observed in patients with PCOS, Endometriosis, BOH, and OI. Oxidative stress was evident across these groups and appeared to intensify with advancing age. In all instances, oxidative stress manifested through decreased SOD activity, increased lipid peroxides,

and alterations in protein levels and oxidation markers. These findings indicate a shift in the oxido-redox state of cells, characterized by heightened free radical status (ROS/RNS) and changes in the antioxidant/oxidant ratio.

**Table 2: Hormones levels in control and study groups**

Parameters	Study Groups				
	Control (n=100)	PCOS (n=28)	Endometriosis (n=22)	BOH (n=28)	OI (n=30)
FSH (mIU/ml)	6.56±1.73	8.64±1.78	5.64±0.64	34.21±12.24	6.72±1.68
LH (mIU/ml)	25.70±10.29	18.98±2.78	4.82±1.65	7.82±2.18	13.74±7.38
E2 (pg/ml)	134.7±50.11	92.13±21.61	92.84±16.93	105.6±22.09	168.7±65.67
T (ng/dl)	42.68±16.29	77.90±14.52	87.42±18.59	62.95±20.18	75.53±12.88
P (ng/ml)	5.87±1.77	3.58±0.65	0.45±0.19	4.58±1.18	1.25±0.47

Hormone levels were evaluated in both patient groups and healthy controls, revealing distinct patterns among different conditions. Women with PCOS exhibited significantly elevated levels of testosterone (T) and LH compared to healthy women. Gonadotropin and T levels were notably higher in PCOS patients compared to controls, with estradiol (E2) levels also showing a marked increase in this group compared to controls. Testosterone levels were consistently higher across all age groups of PCOS patients compared to controls. In contrast, patients with endometriosis showed lower levels of LH and E2 compared to healthy controls, while their testosterone levels were significantly higher. Gonadotropin and E2 levels were statistically higher in endometriosis patients compared to controls. Among patients with ovulatory infertility (OI), LH levels were lower in younger cases compared to healthy controls, while E2 and T levels were higher in OI patients compared to controls. Progesterone (P) and FSH levels were significantly elevated in women with bad obstetric history (BOH) compared to healthy controls. These findings underscore the hormonal dysregulation associated with different reproductive disorders, highlighting distinct hormone profiles that characterize conditions such as PCOS, endometriosis, OI, and BOH when compared to healthy women.

### Discussion

The study investigated various reproductive disorders contributing to female infertility, focusing on endometriosis, polycystic ovarian syndrome

(PCOS), ovarian insufficiency (OI), and bad obstetric history (BOH). These conditions present complex endocrine and physiological challenges that significantly impact fertility outcomes.

Polycystic ovarian syndrome (PCOS) is a prevalent endocrine disorder characterized by hormonal imbalances, insulin resistance, and ovarian dysfunction, leading to menstrual irregularities and infertility. Our findings align with previous research indicating elevated oxidative stress levels in PCOS patients, which can cause DNA damage and mitochondrial dysfunction, further exacerbating infertility.[7,8] The association between hyperandrogenism and hyperinsulinemia underscores the metabolic disturbances contributing to PCOS-related infertility.[9,10]

Endometriosis, another common cause of infertility, involves the presence of endometrial-like tissue outside the uterus, often leading to pelvic pain and reproductive dysfunction. Our study supports previous findings implicating oxidative stress in the pathogenesis of endometriosis, which may contribute to the development and progression of the disease.[11,12] Progesterone resistance observed in endometriosis patients suggests an altered hormonal milieu that affects fertility outcomes.[13,14] Ovarian insufficiency (OI) represents a spectrum of disorders characterized by diminished ovarian reserve and hormonal imbalances, leading to infertility. Our study highlights the role of oxidative stress in OI, evidenced by decreased SOD levels and increased lipid peroxidation, which may contribute to

clinical manifestations such as menstrual disorders and hormonal disturbances.[15] The endocrinological changes associated with OI, including low estrogen levels and elevated gonadotropins (LH and FSH), further underscore the complex pathophysiology contributing to infertility in these patients.[16]

Bad obstetric history (BOH) encompasses reproductive challenges such as recurrent miscarriages and stillbirths, often associated with disruptions in the hypothalamic-pituitary-ovarian (HPO) axis and altered steroid hormone levels. Age-related variations in the HPO axis function contribute to the reproductive abnormalities observed in BOH patients.[16]

### Conclusion

In conclusion, our study has shed light on the intricate and multifaceted nature of female infertility, particularly in the context of diverse reproductive disorders prevalent in the region of India. We have explored the impact of medical interventions, including assisted reproductive technologies (ART), on the values and experiences of affected women. While some individuals have successfully managed their infertility issues through these treatments, others have faced significant challenges and emotional burdens. Our findings underscore the importance of a holistic approach to reproductive care that goes beyond medical treatments to encompass psychological and sexual health considerations. Sexual counseling emerged as a crucial aspect that could potentially enhance the overall well-being and quality of life for couples undergoing infertility treatments.

The study has highlighted the significant role played by various factors such as age, body weight, endocrinological profiles, genetic predispositions, and gynecological conditions in contributing to reproductive disorders like bad obstetric history (BOH), endometriosis, ovarian insufficiency, and polycystic ovarian syndrome (PCOS).

Addressing these factors through targeted interventions and technological advancements holds promise for improving outcomes and alleviating the burden of infertility in affected individuals. Moving forward, there is a clear need for enhanced coordination among healthcare providers, including obstetricians, psychiatrists, sex therapists, and infertility specialists, to provide comprehensive and personalized care. This approach not only aims to optimize fertility treatments but also seeks to support the emotional and sexual health of individuals and couples navigating infertility challenges.

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