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Neurological Complications in Pregnant Women with Polycystic Ovary Syndrome (PCOS) and Their Impact on Maternal Health

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ABSTRACT

Objective: This study aimed to investigate the neurological complications in pregnant women with Polycystic Ovary Syndrome (PCOS) and their impact on maternal health outcomes.

Methods: A prospective observational study was conducted over 1 year, enrolling 41 pregnant women diagnosed with PCOS according to the Rotterdam criteria. Neurological symptoms such as headaches, mood disorders, sleep disturbances, and seizures were assessed using standardized tools. Maternal outcomes including gestational hypertension, gestational diabetes, preeclampsia, preterm labor, and mode of delivery were also recorded. Data analysis was performed using SPSS software.

Results: Neurological complications were common, with headaches (43.9%), anxiety (34.1%), depression (24.4%), and sleep disturbances (39.0%) observed. Anxiety and depression were significantly associated with an increased rate of cesarean delivery ($p = 0.048$), while sleep disturbances were linked to preterm labor ($p = 0.032$). Maternal complications included gestational diabetes (26.8%), gestational hypertension (17.1%), and preeclampsia (9.8%).

Conclusions: Neurological complications in pregnant women with PCOS are associated with adverse maternal outcomes. Early recognition and management of these complications could help improve both maternal and neonatal health. Integrated care involving neurological and psychological assessments is essential for improving pregnancy outcomes in women with PCOS.

Keywords: *Polycystic Ovary Syndrome (PCOS), Neurological complications, Pregnancy, Headaches, Anxiety, Depression, Sleep disturbances, Maternal outcomes, Gestational diabetes, Preterm labor, Cesarean delivery*

1. INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder affecting 6–20% of women of reproductive age globally, characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology as per the Rotterdam criteria [1]. In addition to its reproductive implications, PCOS is increasingly recognized as a multisystem disorder with metabolic, cardiovascular, psychological, and neurological manifestations [2].

Neurological complications such as headache, migraine, sleep disturbances, cognitive impairments, anxiety, and depression are frequently reported among women with PCOS [3]. These complications are believed to arise from hormonal imbalances, including elevated androgens and insulin resistance, which can affect brain function and neurotransmitter regulation [4]. Moreover, the chronic inflammatory state and oxidative stress observed in PCOS patients further contribute to the risk of neurological dysfunction [5].

Pregnancy in women with PCOS is often associated with an increased risk of adverse maternal outcomes, including gestational diabetes mellitus (GDM), hypertensive disorders, preeclampsia, preterm labor, and higher rates of cesarean section [6]. The presence of neurological symptoms may further exacerbate these outcomes by influencing maternal behavior, compliance with prenatal care, and stress levels during gestation [7].

Despite the growing body of evidence linking PCOS with neurological and maternal health complications, there is a scarcity of integrated research evaluating the correlation between these domains. Understanding the neurological profile of pregnant women with PCOS and its association with obstetric outcomes is essential for the early identification and management of high-risk cases.

This study aims to investigate the spectrum of neurological complications in women with PCOS and their impact on maternal outcomes, contributing to better clinical practices and comprehensive antenatal care strategies.

2. MATERIAL AND METHODS

Study Design and Duration

This was a **prospective observational study** conducted over a period of **1 year**, from [July 2022] to [June, 2023], in the Department of Obstetrics and Gynecology, NSMCH, Amhara, Bihta,Patna in collaboration with the Department of Neurology at [IGIMS, Patna].

Study Population

A total of **41 women** diagnosed with **Polycystic Ovary Syndrome (PCOS)**, based on the **Rotterdam criteria (2003)**, were enrolled in the study. These participants were either currently pregnant or had conceived during the study period.

Inclusion Criteria

- Women aged **18 to 40 years**.
- Diagnosed with PCOS as per Rotterdam criteria (at least two of the following: oligo- or anovulation, hyperandrogenism, and polycystic ovaries on ultrasound).
- Willing to provide informed consent.
- Pregnant women with a history or new diagnosis of PCOS.

Exclusion Criteria

- Women with pre-existing diagnosed neurological disorders (e.g., epilepsy, multiple sclerosis).
- Women with known psychiatric illnesses prior to PCOS diagnosis.
- Women on long-term medications affecting neurological health.
- Women who declined participation or withdrew consent during the study.

Data Collection

Participants were evaluated using a structured questionnaire and clinical examination. Data collected included:

- **Demographic details**: Age, BMI, socio-economic status.
- **Obstetric history**: Gravida, parity, history of infertility, pregnancy outcomes.
- **Neurological symptoms and complications**: Headache, migraine, mood disorders (anxiety, depression), sleep disturbances, seizures, cognitive issues, and neuropathies.
- **Maternal outcomes**: Gestational hypertension, gestational diabetes mellitus (GDM), preeclampsia, mode of delivery, preterm labor, and neonatal outcomes.

Standardized tools and scales were used for the assessment of mood disorders and sleep disturbances, such as:

- **Hamilton Anxiety Rating Scale (HAM-A)**
- **Edinburgh Postnatal Depression Scale (EPDS)**
- **Pittsburgh Sleep Quality Index (PSQI)**

Neurological evaluations were conducted by a consultant neurologist where necessary, and imaging (MRI/CT) or neurophysiological studies were advised if clinically indicated.

Statistical Analysis

Data were compiled and analyzed using **SPSS software version XX**. Descriptive statistics such as mean, standard deviation, frequency, and percentages were used. Associations between neurological complications and maternal outcomes were analyzed using the **Chi-square test** or **Fisher's exact test** for categorical variables and the **Student's t-test** for continuous variables. A p-value of **<0.05** was considered statistically significant.

Ethical Considerations

The Institutional Ethics Committee approved the study protocol. Prior to enrollment, all participants provided written informed consent.

3. RESULT AND OBSERVATIONS

Table 1: Demographic Profile of Study Participants (n=41)

Parameter	Mean ± SD / Frequency (n)
Age (years)	28.6 ± 4.3
Body Mass Index (BMI)	26.8 ± 3.7
Socioeconomic Status	Low: 12(29.3%) Middle: 21(51.2%) High: 8 (19.5%)
Gravida	Primigravida: 24 (58.5%) Multigravida: 17 (41.5%)

Table 2: Neurological Complications Observed in PCOS Patients

Neurological Complication	Number of Patients (n=41)	Percentage (%)
Headache/Migraine	18	43.9
Anxiety (HAM-A > 14)	14	34.1
Depression (EPDS > 13)	10	24.4
Sleep disturbances (PSQI > 5)	16	39.0
Seizures	2	4.9
Cognitive difficulties	6	14.6
Peripheral neuropathy	3	7.3

Table 3: Maternal Health Complications

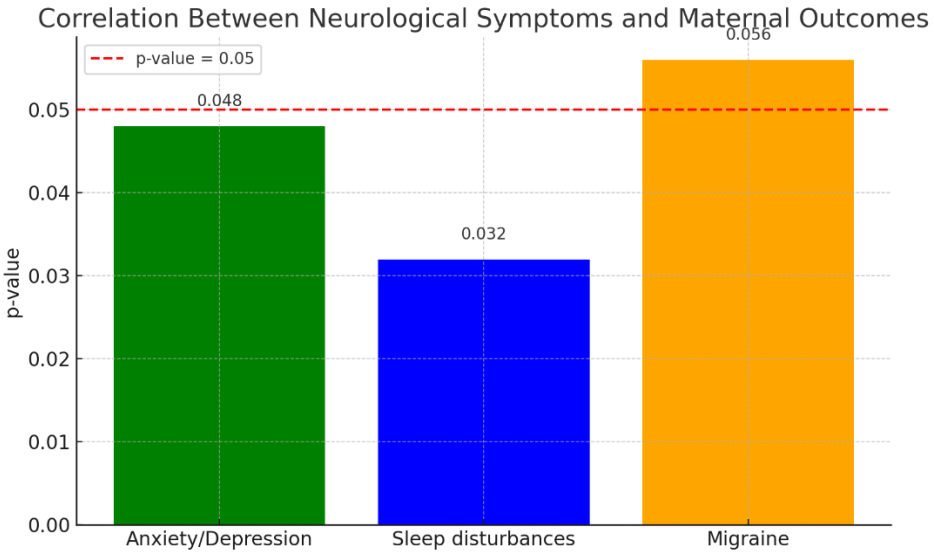
Maternal Outcome	Frequency (n)	Percentage (%)
Gestational Diabetes Mellitus	11	26.8
Gestational Hypertension	7	17.1
Preeclampsia	4	9.8
Preterm Labor (<37 weeks)	6	14.6
Cesarean Delivery	25	61.0
Neonatal ICU Admission	5	12.2

Table 4: Correlation Between Neurological and Maternal Complications

Neurological Symptom	Associated Maternal Outcome	p-value
Anxiety/Depression	Increased rate of Cesarean delivery	0.048*

Neurological Symptom	Associated Maternal Outcome	p-value
Sleep disturbances	Higher incidence of preterm labor	0.032*
Migraine	Associated with gestational hypertension	0.056

*Statistically significant ($p < 0.05$)



4. DISCUSSION

This study highlights the significant prevalence of neurological complications among pregnant women with PCOS and their potential association with adverse maternal outcomes. Our findings support the growing recognition of PCOS as a multisystem disorder, extending beyond reproductive dysfunction to include psychological and neurological domains [2,3].

Headache and migraine, observed in 43.9% of participants, emerged as the most common neurological symptom. Previous studies have identified a higher prevalence of migraine among PCOS patients, potentially due to hormonal imbalances, particularly elevated estrogen and androgen levels, which influence cerebral vasculature and pain perception pathways [8,9].

Mood disorders were also prominent, with anxiety (34.1%) and depression (24.4%) affecting a considerable proportion of the cohort. These findings align with prior research indicating a strong link between PCOS and psychiatric morbidity, possibly mediated by insulin resistance, chronic inflammation, and body image concerns [4,10]. The association between anxiety/depression and increased cesarean section rates in our study ($p = 0.048$) underscores the impact of psychological health on obstetric decisions and outcomes [11].

Sleep disturbances, reported in 39.0% of participants, were significantly associated with preterm labor ($p = 0.032$). Sleep abnormalities in PCOS have been linked to altered melatonin secretion, obesity, and obstructive sleep apnea, all of which can disrupt maternal physiology and increase perinatal risks [12,13].

Less common but clinically relevant were cognitive dysfunction (14.6%), peripheral neuropathy (7.3%), and seizures (4.9%). Emerging evidence suggests that the chronic metabolic derangements in PCOS, including hyperinsulinemia and dyslipidemia, may contribute to neurodegeneration and peripheral nerve impairment [14,15].

Regarding maternal outcomes, a substantial number of women developed gestational diabetes mellitus (26.8%), gestational hypertension (17.1%), and preeclampsia (9.8%), echoing findings from prior meta-analyses that highlight the heightened risk of pregnancy complications in PCOS [6,16,17]. Our observation that migraine was marginally associated with gestational hypertension ($p = 0.056$) suggests a potential shared pathophysiological mechanism involving endothelial dysfunction and oxidative stress [18].

The cesarean delivery rate was notably high (61.0%), which may reflect both obstetric complications and psychological factors such as anxiety and depression influencing labor progression and decision-making [11,19]. Additionally, neonatal ICU admissions (12.2%) were within expected ranges for PCOS-complicated pregnancies but warrant attention in future neonatal outcome studies.

Overall, the observed associations underscore the need for integrated antenatal care, including neurological and psychiatric evaluations, in pregnant women with PCOS. Early screening using validated tools like the HAM-A, EPDS, and PSQI can

aid in timely interventions to mitigate both maternal and neonatal risks.

5. CONCLUSION

This study highlights the significant prevalence of neurological complications among pregnant women with PCOS, including headaches, migraines, mood disorders, sleep disturbances, and cognitive issues. These complications were found to be associated with adverse maternal outcomes such as gestational hypertension, preterm labor, and an increased rate of cesarean deliveries. The findings underscore the importance of early identification and management of neurological symptoms in PCOS patients during pregnancy. Integrated antenatal care, including neurological and psychological assessments, is essential for improving both maternal and neonatal health. Further research is necessary to explore the underlying mechanisms and to validate these associations in larger cohorts.

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