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COMPARATIVE ANALYSIS OF *DOSHA PRAKOPA* FACTORS IN POLYCYSTIC OVARIAN SYNDROME (PCOS) PATIENTS VERSUS PATIENTS WITH COEXISTING PCOS AND NON - ALCOHOLIC FATTY LIVER DISEASE (NAFLD)

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Abstract

Background

Polycystic Ovary Syndrome (PCOS) is a complex endocrine disorder characterised by irregular ovulation, hyperandrogenism and metabolic disturbances, while NAFLD is a hepatic condition marked by abnormal fat accumulation in the liver in the absence of significant alcohol intake. Polycystic Ovary Syndrome (PCOS) and Non-Alcoholic Fatty Liver Disease (NAFLD) frequently coexist due to shared metabolic and pathophysiological pathways. Ayurvedic literature describes *dosha prakopa nidanas* as contributors to metabolic dysfunction, but their relationship with modern metabolic comorbidities has not been extensively studied.

Objective

To assess the association between *dosha-prakopa* factors and the co-occurrence of PCOS and Grade 1 NAFLD.

Methods

An observational cross-sectional study was conducted on 30 female participants aged 17–35 years. Participants were divided into two groups: Group A (n = 15) with PCOS alone and Group B (n = 15) with PCOS and ultrasonography-confirmed Grade 1 NAFLD. A structured, validated questionnaire assessed exposure to *dosha prakopa nidanas* across three domains: *ahara* (dietary), *vihara* (lifestyle), and *manasika* (psychological). Associations were analysed using chi-square tests and odds ratios with 95% confidence intervals.

Results

Kapha prakopa showed a strong trend toward association with the coexistence of PCOS and NAFLD (OR 4.00; 95% CI 0.88–18.26; p = 0.144). The findings are consistent with Ayurvedic descriptions of *Kapha's* heavy and oily qualities contributing to adipogenesis, insulin resistance, and hepatic fat accumulation.

Conclusion

Kapha imbalance may be a potential risk factor for the comorbidity of PCOS and NAFLD. By identifying *Kapha* imbalance as a potential risk factor, it validates classical Ayurvedic reference to the role of *Medoroga* and underscores the need for personalized, *dosha*-specific therapies.

Keywords: Polycystic Ovary Syndrome (PCOS), Non-Alcoholic Fatty Liver Disease (NAFLD), *Dosha prakopa nidana*

Introduction

Polycystic Ovary Syndrome (PCOS) is a highly prevalent endocrine disorder that affects women of reproductive age, characterized by hyperandrogenism, ovulatory dysfunction and polycystic ovarian morphology. It affects around 5% to 18% of women worldwide, making it one of the leading causes of infertility and metabolic dysfunction in this population[1][2]. PCOS has started gaining recognition not only as

a reproductive disorder but also as a complex metabolic syndrome, involving insulin resistance, obesity, dyslipidemia and chronic low-grade inflammation[3]. These metabolic disturbances contribute to an elevated risk of type 2 diabetes mellitus, cardiovascular diseases, and other systemic complications [4].
Non-Alcoholic Fatty Liver Disease (NAFLD) is a metabolic disorder which is defined by excessive fat accumulation in the liver without any significant alcohol consumption and has emerged as the most common chronic liver disease globally. NAFLD encompasses a spectrum ranging from simple steatosis to non alcoholic steatohepatitis (NASH), fibrosis, and cirrhosis. Recent epidemiological studies have documented a higher prevalence of NAFLD in women with PCOS compared to age- and body mass index (BMI)-matched controls, with estimates ranging from 15% to over 40%[1][7]. This association is clinically significant as NAFLD in PCOS patients may progress to advanced liver disease, contributing to increased morbidity and mortality. The pathogenesis linking PCOS and NAFLD is multifactorial, with insulin resistance playing a central role in both conditions[1][9].

Classical Ayurvedic texts describe PCOS-like conditions under terms such as *Artava Kshaya* (deficiency of menstrual blood) and *Nashtartava* (absence of menstruation), often attributed to *Kapha dosha* aggravation obstructing *Vata dosha*, leading to impaired *Agni* (digestive/metabolic fire) and accumulation of *Ama* (toxins). This pathophysiology correlates with clinical features of hormonal imbalance, ovarian cyst formation, and menstrual irregularities observed in PCOS.

NAFLD, while not explicitly named in classical texts, aligns with disorders like *Medoroga* (fat metabolism disorders). Ayurvedic pathogenesis attributes NAFLD to *Kapha* and *Pitta dosha* aggravation, resulting from *Viruddha Ahara*, sedentary lifestyle, and impaired *Agni*, leading to *Ama* accumulation in *Srotas*. This results in impaired liver function, fat accumulation and inflammation, paralleling modern NAFLD pathology.
Despite the growing prevalence of PCOS and NAFLD and their shared metabolic underpinnings, limited research has explored these conditions through the Ayurvedic lens of *dosha prakopa nidanas*. Identifying distinct *dosha prakopa* profiles in patients with PCOS alone versus those with coexisting NAFLD may provide a more refined basis for therapeutic planning.

This study aimed to develop and validate a questionnaire based on classical Ayurvedic texts to assess *dosha prakopa* factors and perform a comparative analysis between these patient groups.

Materials and methods

The methodology for this study was meticulously designed to investigate the association between Ayurvedic *dosha prakopa nidanas* (aggravated bioenergetic factors) and the co-occurrence of Polycystic Ovary Syndrome (PCOS) and Grade 1 Non-Alcoholic Fatty Liver Disease (NAFLD). The study employed an observational, cross-sectional comparative design to evaluate the role of *Vata, Pitta,* and *Kapha* imbalances in the pathogenesis of these metabolic disorders.
An observational, cross-sectional comparative survey was adopted to analyze the relationship between Ayurvedic *dosha prakopa nidanas* and the presence of PCOS with or without Grade 1 NAFLD. Cross-sectional studies are particularly suited for assessing prevalence and associations at a specific point in time, making this design appropriate for identifying risk factors linked to the dual diagnosis of PCOS and NAFLD. The comparative aspect involved two groups:

I. Group A: Patients diagnosed with PCOS only.
II. II. Group B: Patients diagnosed with PCOS and Grade 1 NAFLD.

The primary objective was to determine whether specific *dosha prakopa* factors (*Vata, Pitta*, *Kapha*) were disproportionately associated with the co-occurrence of PCOS and NAFLD. The study was conducted over two months, with data collection, analysis, and interpretation completed within this time frame.
The study included female participants aged between 17 and 35 years who had a confirmed diagnosis of Polycystic Ovary Syndrome (PCOS) based on the Rotterdam criteria, fulfilling at least two of the following three features: oligo-anovulation, hyperandrogenism, and polycystic ovarian morphology. Participants with Grade 1 Non-Alcoholic Fatty Liver Disease (NAFLD), verified through abdominal ultrasonography indicating hepatic steatosis greater than 5% without a history of significant alcohol consumption, were also included. Only those who expressed willingness to participate and provided informed consent were enrolled in the study.

Participants were excluded if they had pre-existing liver diseases such as viral hepatitis or alcoholic liver disease, or other metabolic disorders unrelated to NAFLD, including Wilson's disease or hemochromatosis. Individuals who were unwilling to participate or who submitted incomplete questionnaire responses were also excluded from the study.

Participants were recruited from the outpatient and inpatient departments of *Prasootitantra* and *Streeroga* or gynaecology in VPSV Ayurveda College Hospital, Kottakkal. Potential candidates were identified through hospital records and referrals from treating physicians. A total of 30 participants were enrolled, with 15 patients in each group (PCOS-only and PCOS+NAFLD).

A structured CRF was developed to capture:

- Demographic Data: Age, occupation, marital status, and socioeconomic background.
- Clinical History: Duration of PCOS, menstrual irregularities, comorbidities (e.g., obesity, diabetes), and family history of metabolic disorders.
- Diagnostic Confirmation: USG reports NAFLD (hepatic steatosis) were reviewed and validated by a radiologist and a confirmed diagnosis of PCOS by a registered medical practitioner was collected.

A validated questionnaire was designed to assess exposure to *dosha*-aggravating factors, aligned with classical Ayurvedic texts (*Charaka Samhita*, *Ashtanga Hridaya, Sushruta Samhita*). The questionnaire comprised three domains and included 10 questions after face validity:

1. *Ahara* (Dietary Factors)
    - Frequency of consuming heavy, oily, sweet, or cold foods (*Kapha*-aggravating).
    - Intake of spicy, sour, or salty foods (*Pitta*-aggravating).
    - Irregular meal timings or fasting (*Vata*-aggravating).
2. *Vihara* (Lifestyle Factors):
    - Sedentary habits, lack of exercise, or excessive sleep.
    - Exposure to cold or windy environments (*Vata*-predominant climates).
    - Irregular daily routines (*dinacharya*).
3. *Manasika* (Psychological):
    - Stress, anxiety, or emotional disturbances.
    - Sleep disturbances or insomnia.

The questionnaire underwent face and content validation.

- Face Validity: 1st stage of questionnaire wherein the first draft was reviewed by seven *Ayurvedic* practitioners to ensure clarity and cultural relevance.
- Content Validity: The tool underwent content validity assessment by a panel of seven specialists in research, literature study, *prasootitantra*, and *kayachikitsa*, ensuring comprehensive coverage and clarity.

Validation Parameters

Each of the 32 questions was evaluated using four validation criteria:

1. Relevance (1 = Not Relevant, 4 = Highly Relevant)
2. Clarity (1 = Not Clear, 4 = Highly Clear)
3. Simplicity (1 = Not Simple, 4 = Highly Simple)
4. Confusion (1 = Very Confusing, 4 = Not Confusing at All)

Table 1 - Summary Statistics (Average Ratings Across All Items)

Parameter	Mean Score (out of 4)
Relevance	3.06
Clarity	2.82
Simplicity	3.32
Lack of Confusion	3.06

Statistical analysis

Data analysis

Coding: Responses were coded numerically (e.g., "Yes" = 1, "No" = 0).

Dosha Scoring: Each participant received a cumulative score for *Vata, Pitta*, and *Kapha* based on their questionnaire responses. Scores were categorized as "high" or "low" using median cutoffs.

Analytical Methods

- Chi-square Test: Used to compare the distribution of high *dosha* scores between Group A (PCOS-only) and Group B (PCOS+NAFLD).
- Odds Ratio (OR): Calculated to estimate the likelihood of PCOS+NAFLD in participants with high *dosha* scores.
- 95% Confidence Intervals (CI): Provided to assess the precision of OR estimates.

Quality Control Measures

A pilot study involving five participants was conducted to refine the questionnaire and identify potential logistical challenges prior to the main study. To ensure data accuracy, a double data entry process was implemented, wherein 20% of the records were randomly selected and cross-verified to minimize entry errors.

Interpretation

- High *Pitta* Prakopa: An inverse relationship was observed (OR=0.29, 95% CI: 0.06–1.45), though this was also non-significant (p=0.245).
- High *Kapha* Prakopa: A strong trend toward significance emerged (OR=4.00, 95% CI: 0.88–18.26, p=0.144), suggesting *Kapha* imbalance may play a role in the comorbidity.

Observations and results

Table 2 - *Association Between Dosha Prakopa and PCOS with NAFLD*

Dosha Variable	Chi-square	*p*-value	Odds Ratio (OR)	95% CI (Lower)	95% CI (Upper)
High Vata	0.574	0.449	2.41	0.52	11.10
High Pitta	1.350	0.245	0.29	0.06	1.45
High Kapha	2.133	0.144	4.00	0.88	18.26

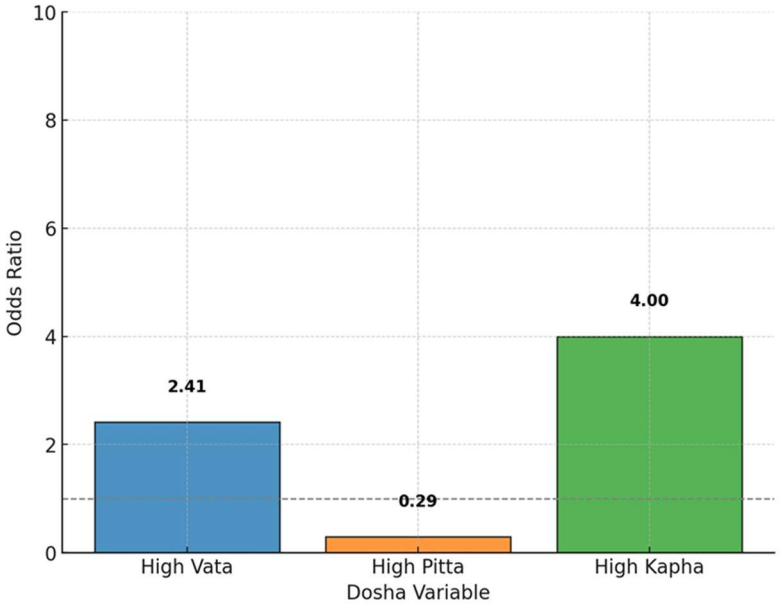

Figure 1 :Odds ratio with 95% confidence interval for *dosha* variables

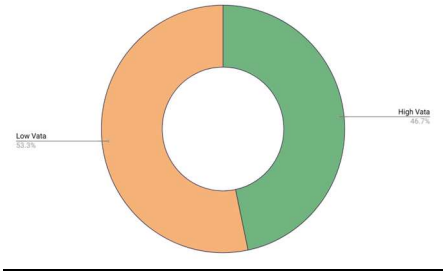

Figure 2 ***: Vata Prakopa Distribution in case***

Observation:

Higher prevalence of High *Vata* in cases (46.7% vs 26.7% in controls), aligning with the odds ratio (OR = 2.41). High *Vata prakopa* showed a non-significant positive trend (OR = 2.41, p = 0.449). *Vata*, associated with movement and nervous system regulation, may disrupt *Artavavaha Srotas* (reproductive channels), contributing to menstrual irregularities and cystic changes in PCOS. Its role in NAFLD is less clear but may involve erratic lipid metabolism due to impaired *Vata*-driven enzymatic activity. The wide confidence interval (0.52–11.10) suggests substantial variability, likely exacerbated by the small sample size. Larger studies are needed to clarify *Vata*'s contribution to metabolic dysfunction.*Kapha* Prakopa Distribution
PCOS-only (Control):

- High *Kapha*: 13.3% (2/15)
- Low *Kapha*: 86.7% (13/15)

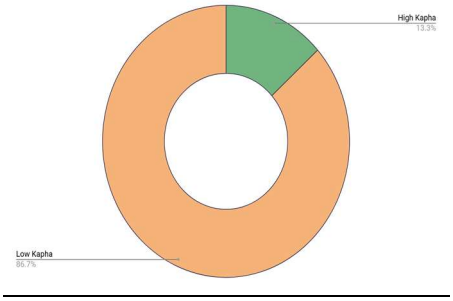

Figure 3 ***: Kapha Prakopa Distribution in control***

PCOS+NAFLD (Case):

- High *Kapha*: 40.0% (6/15)
- Low *Kapha*: 60.0% (9/15)

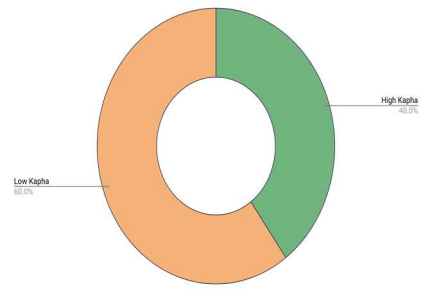

Figure 4 ***: Kapha Prakopa Distribution in case***

Kapha Prakopa and Metabolic dysregulation

The strongest observed association was between high *Kapha prakopa* and the co-occurrence of PCOS and NAFLD (OR = 4.00, $p = 0.144$). This aligns with Ayurvedic principles, where *Kapha* is linked to *Medoroga* and *Srotorodha*. Excessive *Kapha* aggravates *meda dhatu* (adipose tissue), leading to hepatic steatosis and ovarian cyst formation, hallmarks of NAFLD and PCOS, respectively. Modern studies corroborate this, identifying obesity and insulin resistance-both *Kapha*-dominant pathologies-as central to both conditions. The near-significance of *Kapha's* association underscores its potential clinical relevance, warranting larger-scale validation.

Discussion

This study explored *dosha prakopa* patterns in PCOS and NAFLD, two common metabolic disorders increasingly seen together due to shared mechanisms such as insulin resistance and adiposity. The topic was selected because, despite strong biomedical evidence on their overlap, the Ayurvedic perspective on *dosha* aggravation in this comorbidity remains under-investigated. A cross-sectional study was employed to efficiently assess associations at a single time point, supported by a validated questionnaire to capture *ahara*, *vihara*, and *manasika nidanas*. *Kapha prakopa* showed the strongest trend toward association with PCOS and NAFLD, aligning with both Ayurvedic descriptions of *Kapha*-driven *Medoroga* and modern metabolic findings. *Vata* showed a weaker trend, and *Pitta* demonstrated an inverse pattern, suggesting limitations in assessing stage-specific inflammatory activity.

Conclusion

This project represents a seminal effort to integrate Ayurvedic pathophysiology with modern metabolic research. By identifying *Kapha* prakopa as a potential driver of PCOS-NAFLD comorbidity, it advances the understanding of these conditions beyond conventional biomedical paradigms. The study's significance lies in its dual contribution: enriching Ayurvedic research with empirical evidence and offering actionable insights for patient-centered care. As metabolic disorders continue to rise globally, such integrative approaches may pave the way for sustainable, cost-effective solutions that address both biological and energetic dimensions of health. The study provided preliminary evidence supporting *Kapha*-focused therapeutic approaches in patients with dual diagnoses.

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