Research Protocol

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Ayurveda Section

Correlation of Serum Uric Acid and Urinary Uric Acid in *Vatarakta* (Gout) in Context with *Dhatwagni Siddhant*: A Case-control Study Protocol

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ABSTRACT

Introduction: *Vatarakta*, in contemporary medicine, gouty arthritis is an Ayurvedic condition involving a *Vata dosha* imbalance that affects *Rakta dhatu* (blood tissue) are comparable. The purpose of this study is to investigate, within the context of the Ayurvedic concept of *Dhatwagni* Siddhant (Tissue metabolism theory), the relationship between Serum Uric Acid (SUA) and urine uric acid in *Vatarakta* (gout).

Need of the study: There is limited research comparing serum and urinary uric acid levels in *Vatarakta* (Gout), especially in relation to Ayurvedic principles like *Dhatwagni Siddhant*. This study aims to bridge the gap between Ayurveda and modern science by correlating traditional *Hetu* with biochemical markers. It will help validate Ayurvedic concepts and support integrative approaches for better diagnosis and management.

Aim: To study the correlation between SUA and urinary uric acid in *Vatarakta* (Gout) in the context of *Dhatwagni Siddhant*.

Materials and Methods: A case-control study will be conducted at Mahatma Gandhi Ayurved College, Hospital and Research Centre from May 2025 to March 2026, including 86 patients (43 in each group) aged 30-65 years, diagnosed with *Vatarakta* (gout) at Mahatma Gandhi Ayurved College, Hospital and Research Centre Salod (H) Wardha for the case group, and healthy volunteers for the control group. SUA and urinary uric acid tests will be the objective parameters. Normality will be assessed using the Shapiro-Wilk test, with appropriate parametric (Independent t-test, Pearson's correlation) or non-parametric (Mann-Whitney U test, Spearman's correlation) tests applied accordingly. Chi-square test will be used for categorical variables, and a p-value <0.05 will be considered statistically significant.

Keywords: Ayurveda, *Dinacharya*, Gouty arthritis, Hyperuricaemia

INTRODUCTION

People today are more susceptible to metabolic diseases as a result of their poor eating habits and sedentary lifestyle. These conditions could result in devastating illnesses or functional disability. The most significant of these ailments is *Vatarakta*, which is one of the maladies caused by the conjugation of Vitiated *Vata and Rakta* [1].

According to Ayurveda, *Vatarakta* is a sickness caused by an imbalance in *Vata dosha* that affects *Rakta dhatu*, or blood tissue. The classical works *Vatarakta*, *Adhyavata*, *Vatabalasa*, and *Khuddavata* include several references and descriptions of this illness [2]. According to *Acharya Charaka*, *Vatarakta* is *Adhyavata*. The illness's name indicates that *Adhya*, or wealthy individuals, are more likely to get it. This condition is characterised by aggravated *Rakta* obstructing aggravated *Vata*, which in turn aggravates *Rakta*. Lastly, various situations, such as injury, have an overall impact on the entire *Rakta* [3].

According to contemporary medical knowledge, it resembles "gouty arthritis". It is a hyperuricaemia-related condition of purine metabolism that causes patients' daily lives to become disrupted. It is characterised by discomfort and swelling in the Inter-Metatarsophalangeal Joint (IMTP) first, then additional joints [4].

Mainly observed in rich people, hence termed as (*Aadhyavata*) who consume alcohol, dairy products and protein-rich food and have a vata-provoking lifestyle. Although the disease affects tarsals but since the blood gets vitiated first to cause the joint abnormality, this is been classified under disease of *Raktavaha Srotas* in Ayurveda [5].

In the general population, the prevalence of gout ranges from 2 to 26 per 1000, with an incidence of 0.2 to 3.5 per 1000 [6]. Uric acid can bridge the gap between traditional and contemporary perspectives on this SUA is a well-established marker for hyperuricaemia. However, exploring the correlation between Ayurvedic concepts like *Hetu* in *Vatarakta* and biochemical parameters such as SUA and urinary condition.

Hyperuricaemia is a metabolic condition characterised by elevated levels of uric acid in the blood, and it is a precursor to various clinical manifestations, including gout and hyperuricaemia-related conditions such as *Vatarakta* (gout) [7]. The pain in *Vatarakta* is described as *"Akhuvisha Evam Pida"* ("Swelling" or "Inflammation"). as it gradually spreads and manifests its symptoms [6].

Vatarakta has been explained decoratively in *Brihatrayi* i.e., by Acharya Charaka, Acharya Sushruta and Acharya Vagbhata. The synonyms of *Vatarakta* - *Khuda Roga, Vata-Balasa, and Adhya Vata. Vata Dosha* and *Dushya Rakta* are both vitiated at the same time in *Vatarakta*. While *Charak* and *Vaghbhat* give this illness its chapter, Sushruta described it under *Vatavyadhi* [7]. According to modern medical science, *Vatapittadhika* and gouty arthritis are associated due to their identical symptoms and etiological variables. The *Sparshasahatva* (severe soreness in affected joints), *Raga* (erythema), *Sopha* (swelling), *Sandhi Shula* (joint pain), and *Stambha* (joint stiffness) are some of the symptoms that define this condition [8]. *Vatarakta* responds well to a variety of therapy approaches. *Vasti karma* in *Vatarakta* is a highly acclaimed therapy approach. The *Charaka acharya* asserts that there isn't a treatment for *Vatarakta* that is comparable to *Vasti*. In terms of decreasing treatment length, altering the underlying illness, and alleviating symptoms early, *vasti karma* treatment still offers certain advantages over all other methods [9].

Integrating Ayurvedic principles with modern medical research allows for a more comprehensive understanding of hyperuricaemia and *Vatarakta (Gout)*. This can lead to holistic treatment approaches that address the root causes identified in Ayurveda alongside conventional interventions.

Scientific investigation into Ayurvedic principles enhances the credibility of traditional knowledge. Establishing a correlation between *Hetu* in *Vatrakta* and biochemical markers like SUA and urinary uric acid can contribute to the validation of Ayurvedic concepts in the context of modern medical understanding.

REVIEW OF LITERATURE

According to Ayurvedic principles, the *Dhatwagni Siddhant* refers to the concept of metabolic fire (*Agni*) specific to each bodily tissue (Dhatu). Proper functioning of *Dhatwagni* ensures the adequate transformation and nourishment of successive *Dhatus*, maintaining physiological balance. In the context of *Vatarakta (gout)*, impaired *Rasagni* and *Raktagni* (the *Agni* of plasma and blood tissues) can lead to the accumulation of metabolic waste, notably *Ama* and excess uric acid, which parallels the modern understanding of hyperuricaemia. This dysfunction in *Dhatwagni* contributes to improper digestion and assimilation, leading to the vitiation of *Vata* and *Rakta*, which ultimately results in joint inflammation and pain. Thus, *Dhatwagni* plays a critical role in both the pathogenesis and treatment of gout by regulating metabolic transformations at the tissue level, and its correction is a therapeutic target in Ayurveda [10].

Clinical studies have explored the understanding and management of *Vatarakta* through Ayurvedic perspectives. Patel P et al., (2020) in a systematic review highlighted that Panchakarma therapies such as *Siravyadha* and *Guduchi Siddha Yoga Basti* offer significant relief in symptoms of *Vatarakta*, along with formulations like *Punarnava-Amrita Guggulu* and *Bodhi Vruksha Kashaya* under *Shamana Yoga* [11]. Arya C and Gupta S (2018) emphasized the fundamental role of Panchakarma in Ayurvedic treatment of *Vatarakta* [12]. Bhatt KL and Khader A (2020) attempted to bridge modern and Ayurvedic concepts to understand and manage the condition [13]. However, all three studies share notable limitations: none provide sufficient discussion on biochemical parameters such as serum and urinary uric acid levels, and none employed a case-control study design.

Avarana has a specific and very important role in the pathology of *Vatarakta* and there is a direct relation between the pathology of hyperuricaemia, gouty arthritis, and *Vatarakta*. Both disorders have similar causes, relevant pathogenesis, symptoms, and site of disease [14]. These findings underscore the complexity of diagnosing gout during acute flares, as SUA levels may not be elevated due to increased excretion. Therefore, clinicians should consider the timing of SUA measurements and the influence of inflammatory processes when diagnosing and managing gout.

This study aims to explore the correlation between SUA and urinary uric acid in patients with *Vatarakta* (Gout), providing insights through the lens of *Dhatwagni Siddhant*, and thereby contributing to the integration of Ayurvedic and modern diagnostic approaches.

Primary objective: To assess the correlation of SUA and urinary uric acid in *Vatarakta* (Gout) in the context of *Dhatwagni Siddhant.*

Secondary objective: To assess *Aaharaj Hetu* in *Vatarakta* (Gout). "dietary causes" or "aetiological factors related to food"

Null Hypothesis (H_0): There is no significant correlation between the SUA and urinary uric acid in *Vatarakta* (Gout) in the context of *Dhatwagni Siddhant.*

Alternate Hypothesis (H_1): There is a significant correlation between the SUA and urinary uric acid in *Vatarakta* (Gout) in the context of *Dhatwagni Siddhant.*

MATERIALS AND METHODS

A case-control study will be conducted on patients diagnosed with *Vatarakta* (Gout) from May 2025 to March 2026 at the Outpatient Department (OPD) of *Kayachikitsa* at Mahatma Gandhi Ayurved College, Hospital and Research Centre, DMIHER, Wardha, Maharashtra, India. The Institutional Ethics Committee has approved the study under the Reference number MGACHRC/IEC/JUN-2024/860. Informed consent will be obtained from all subjects before conducting the study.

Inclusion criteria for the case group (Group-A): Individuals aged between 30 and 65 years, irrespective of gender, who have provided written informed consent and have a confirmed diagnosis of *Vatarakta* (Gout), and SUA level above the range of normal uric acid levels are 2.4-6.0 mg/dL (female) and 3.4-6.9 mg/dL (male) [15]. For the Control Group (Group-B), the inclusion criteria include healthy individuals within the same age range (30-65 years), regardless of gender, who have given written informed consent and show no signs of hyperuricaemia or any clinical diagnosis of *Vatarakta* (Gout).

Exclusion criteria: Individuals will be excluded from the study if they have known renal or hepatic diseases; are pregnant or lactating; are taking medications such as Non-steroidal Anti-inflammatory Drugs (NSAIDS), colchicine, corticosteroids, anticoagulants, diuretics, or other drugs that alter uric acid excretion; have diabetes; exhibit serum Alanine Transaminase (ALT) or Aspartate Transaminase (AST) levels greater than 1.5 times the upper limit of normal or bilirubin levels greater than twice the upper limit of normal, indicating hepatic insufficiency; or have malignant tumours, active tuberculosis, blood disorders, active peptic ulcers with heart disease, or renal insufficiency.

Sample size calculation: The sample size required to compare two means is calculated using the formula:

$$n \geq ((Z_{1-\alpha/2}+Z_{1-\beta})^2 \times (\sigma_1^2+\sigma_2^2/r))/(\mu_1-\mu_2)^2$$

Where:

- n: Minimum sample size per group
- $Z_{1-\alpha/2}$: Z-score for the desired confidence level=1.96 (for α=0.05)
- $Z_{1-\beta}$: Z-score for desired power=0.84 (for 80% power)
- σ_1: Standard deviation in Group-1 (control) = 1.35
- σ_2: Standard deviation in Group-2 (cases) = 2.82
- r: Ratio of group sizes (Group-2 / Group-1) = 1
- μ_1: Mean uric acid level in Group-1 (control) = 4.2 mg/dL
- μ_2: Mean uric acid level in Group-2 (cases) = 5.54 mg/dL

These mean values were reported by Mukhopadhyay P et al., (2019) [16]

The mean difference:

$\mu_1-\mu_2$=4.2-5.54=-1.34

Substituting the values:

$n \geq ((1.96+0.84)^2 \times 9.7749)/1.7956$

$n \geq (7.84 \times 9.7749)/1.7956$

$n \geq 76.6368/1.7956 \approx 42.69$

Thus, the minimum sample size per group is 43, and the total sample size is 86 (43 in each group).

Study Procedure

Assessment of *Āhāraj Hetu* (dietary causes) in *Vatarakta* (Gout) will be done on the basis of sign and symptoms of *Vatarakta* (Gout) [8] and contemporary dietetics will be used to record the type, quality, quantity, and timing of food intake, with particular attention to purine-rich foods such as red meat, seafood, fermented items, alcohol [17] and incompatible food combinations (*Viruddha Āhāra*), which are known to vitiate *Vata* and *Rakta* [18]. Tools like 24-hour

dietary recall, Food Frequency Questionnaires (FFQ), and patient food diaries help quantify the intake of aggravating foods [19]. Patterns such as irregular eating, excessive consumption of heavy or oily foods, or intake of cold water after meals will also be noted, as these are believed to cause *Ama* formation and impair *Dhatwagni*. The data will be then correlated with clinical parameters like serum and urinary uric acid levels to evaluate the impact of dietary habits on the onset and severity of *Vatarakta*, thus offering a holistic view of diet as an aetiological factor in disease manifestation.

Assessment of SUA will be conducted to identify values surpassing the normative thresholds [20]. Subjective parameters will be assessed and graded based on the severity of symptoms, using grades 0, 1, 2, or 3 [Table/Fig-1] [21].

S. No.	Symptoms	Grade 0	Grade 1	Grade 2	Grade 3
1.	*Daha* (Burning)	No *Daha*	Occasionally localised *Daha* for more than half an hour daily	*Daha* throughout the day but well tolerated	Severe degree of *Daha* that is intolerable
2.	*Sandhi shoola* (Joint pain)	No pain	Pain is felt only at the time of movement	Persistent pain not affecting daily routine	Pain is persistent and affects daily routine
3.	*Sandhi stabdhata* (Stiffness)	No stiffness	Mild stiffness	Restricted movements	Total loss of movements
4.	*Sandhi tamravarnata* (Erythema)	Nil	Mild	Moderate	Severe
5.	*Sandhi shyavata* (Discoloration)	Nil	Mild	Moderate	Severe
6.	*Sandhi sparshasahatva* (Tenderness)	No tenderness	Tender but bearable	Tender and not bearable	Tender and not bearable and withdraw
7.	*Sandhi kriyakashtta*	Nil	Mild	Moderate	Severe

[Table/Fig-1]: Subjective parameters [22].

STATISTICAL ANALYSIS

The software R 4.4.0 will be used for statistical evaluation. Normality of continuous data will be assessed using the Shapiro-Wilk test. Intergroup comparisons will be done using the Independent t-test or the Mann-Whitney U test, based on data distribution. Pearson's or Spearman's correlation will be used to assess the relationship between serum and urinary uric acid levels. Chi-square test will be applied for categorical data. A significance level of $p<0.05$ will be considered statistically significant.

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