International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Correlating Thyroid Dysfunction with Ayurvedic Concepts of Ama and Agni: An Observational Study

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Abstract

Background: Thyroid disorders are among the most common endocrine problems worldwide, with increasing prevalence in India. Ayurveda associates Metabolic Dysfunctions with *Agni* and *Ama*. This study explores correlation between deranged thyroid function test and ayurvedic parameters *Agni, Ama* and lifestyle factors- to provide an integrative perspective on thyroid dysfunction.

Objective: To correlate deranged TFT patterns with Ayurvedic parameters including *Agni* and *Ama,* and to examine lifestyle, comorbidities, and family history as potential modifiers.

Methods: A retrospective observational study was conducted among patients who underwent TFTs (T3, T4, TSH). Data were retrieved from hospital records, supplemented by telephonic follow-up. Participants with at least one deranged TFT parameter were included. *Agni* and *Ama* were assessed using validated scales, and associations with TFTs and lifestyle factors were analyzed using different statistical tests.

Results: *Mandagni* was strongly associated with elevated TSH, while *Teekshnagni* correlated with high T4. Patients with *Mandagni* demonstrated higher *Ama* scores and fatigue prevalence. Physical activity influenced TFT profiles — active individuals showed healthier T4 and TSH levels.

Conclusion: Ayurvedic parameters of *Agni* and *Ama* offer valuable complementary insights into thyroid dysfunction. Integrating Ayurvedic assessment with laboratory testing may enhance comprehensive diagnosis and management of thyroid disorders.

Keywords: *Agni*, *Ama*, thyroid function tests, retrospective study

Introduction

Thyroid disorders are among the most frequently encountered endocrine dysfunctions globally, with profound implications for metabolism, growth, and overall well-being. In India, an estimated 42 million individuals suffer from thyroid-related conditions, making it a significant public health concern[1]. The thyroid gland synthesizes thyroxine (T4) and triiodothyronine (T3), which regulate basal metabolic rate and energy expenditure. This hormonal balance is maintained by the hypothalamic–pituitary–thyroid (HPT) axis, which operates through negative feedback mechanisms involving thyrotropin-releasing hormone (TRH) and thyroid-stimulating hormone (TSH)[2].

Disruption in this axis leads to two predominant conditions: hypothyroidism (hormone deficiency) and hyperthyroidism (hormone excess). Clinically, these manifest as fatigue, weight fluctuations, cognitive disturbances, and cardiovascular changes, with severe cases progressing to myxedema coma or thyroid storm.

From an Ayurvedic standpoint, metabolic activity and systemic transformation are governed by *Agni*—the biological fire responsible for digestion and tissue metabolism. Impairment in *Agni* (*Agnimandya*) leads to accumulation of *Ama*[3], a toxic, undigested residue that obstructs channels and deranges *Doshas*. Since thyroid hormones influence nearly every cellular metabolic process, their dysfunction parallels the concept of *Agnivaishamya*[4].

Hence, exploring thyroid disorders through the integrative lens of Ayurveda, focusing on *Agni* and *Ama*, can offer a deeper understanding of disease pathogenesis and patient-specific management.

Objectives

Primary Objectives

1. To identify deranged TFT patterns and correlate them with *Agni* assessment[5] results.
2. To correlate deranged TFT patterns with *Ama* assessment[6].
3. To assess associations between deranged TFT results, lifestyle[7], comorbidities, family history[8], and iodized salt usage[9].

Secondary Objective

To assess the feasibility of integrating Ayurvedic parameters with standard thyroid diagnostics through telephonic and record-based data collection.

Methods

Study Design

A retrospective, observational study based on patient data from SDACH's laboratory and telephonic follow-up, was conducted.

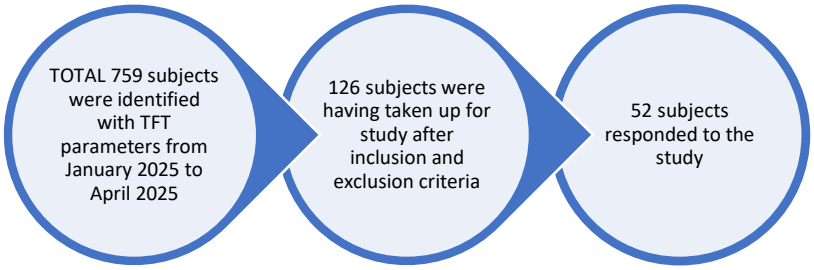
Study Setting

Data were obtained from hospital laboratory records and telephonic interviews. The study utilized purposive sampling to identify eligible participants.

Participants

Inclusion criteria comprised patients (both sexes) who had undergone TFTs (T3, T4, TSH) with at least one deranged parameter. Pregnant women and those with all parameters within normal range were excluded.

The study initially screened 759 patient records from the hospital laboratory database. Of these, 633 cases were excluded. A total of 126 participants fulfilled the inclusion criteria, out of which 52 subjects completed telephonic follow-up for Ayurvedic assessment. This participant flow ensured data integrity and is depicted schematically in the patient flow chart.



Data Sources and Variables

Data were sourced from laboratory records and telephonic questionnaires. Standardized and validated *Agni* and *Ama* assessment tools were used. Collected variables included:

- **Biomedical:** Serum levels of T3, T4, and TSH.
- **Ayurvedic:** *Agni* type (*Mandagni, Samagni, Teekshnagni, Vishamagni*), *Ama* score.
- **Lifestyle and Other Factors:** Physical activity, comorbidities, use of iodized salt, family history.

Sampling Technique: Purposive sampling was applied to identify cases with at least one deranged TFT value, ensuring relevance for the research objective.

Statistical Methods

Data were analyzed using JAMOVI (Version 2.6.44) and SPSS VERSION 27. Descriptive statistics for continuous variables are presented as means with standard deviations (SD) and 95% Confidence Intervals (CI) where appropriate. Categorical variables are presented as frequencies and percentages.

(a) Control for Confounding: The primary analyses assessed associations between categorical variables (e.g., *Agni* type and thyroid status) using Pearson's Chi-square tests. Where cell counts were less than 5, Fisher's exact test was reported.

(b) Subgroups and Interactions: Group differences in continuous thyroid parameters (T3, T4, TSH) and *Ama* scores across levels of physical activity and *Agni* types were analyzed using one-way ANOVA. Welch's test was used when the assumption of homogeneity of variances was violated. Post-hoc pairwise comparisons were conducted using Tukey's HSD test, with mean differences and their 95% CIs reported.

(c) Missing Data: The analysis was performed on a complete-case basis. There were no missing data for the primary variables (TFTs, *Agni, Ama*) in the final analytical sample of 52 participants, as these were requisites for inclusion and follow-up.

(d) Addressing Sampling Strategy: As a cross-sectional study using purposive sampling, the analytical methods (chi-square, ANOVA) were chosen to describe associations within the selected cohort, without inference to a broader population.

(e) Sensitivity Analyses: No formal sensitivity analyses were performed.

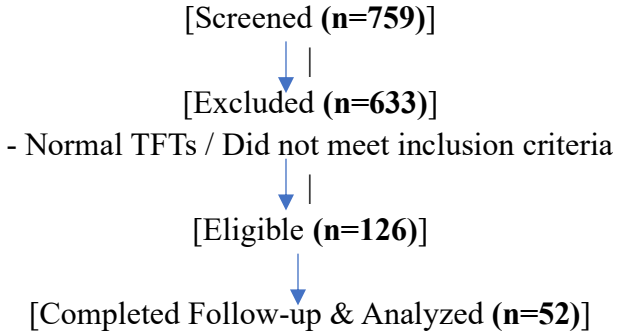
Results:

Participants

A total of 759 patient records were screened from the hospital laboratory database. After applying the inclusion and exclusion criteria, 126 participants were eligible for the study. Of these, 52 participants

(41.3% of eligible subjects) completed the telephonic follow-up and were included in the final analysis. The participant flow is summarized in Figure 1. The primary reason for non-participation at the follow-up stage was an inability to contact the patient.

Figure 1. Flow of participants through the study



Descriptive Data

The demographic and clinical characteristics of the 52 study participants are presented in Table 1. The cohort was predominantly female (76.9%) and middle-aged (mean age predominantly in the 40-59year bracket). The most frequently reported symptoms were fatigue (80.8%) and hair loss (69.2%). Over half of the participants (53.8%) reported associated comorbidities, and a family history of thyroid disorders was present in 48.1% of participants.

Table 1. Characteristics of Study Participants (n=52)

Characteristic	Category	n	%
Age Group	<20 years	1	1.9%
	20-39 years	21	40.4%
	40-59 years	22	42.3%
	≥60 years	8	15.4%
Gender	Female	40	76.9%
	Male	12	23.1%
Presenting Complaints	Fatigue	42	80.8%
	Hair Loss	36	69.2%
	Weight Changes	34	65.4%
	Joint Pain	34	65.4%
Associated Comorbidities	Present	28	53.8%
	Absent	24	46.2%
Family History of Thyroid Disorder	Present	25	48.1%
	Absent	27	51.9%
Use of Iodized Salt	Yes	45	86.5%
	No	7	13.5%

Outcome Data

The distribution of thyroid function test abnormalities is shown in Table 2. The most common derangement was isolated TSH abnormality (n=26, 50.0%), followed by isolated T4 abnormality (n=16, 30.8%). Seven

participants (13.5%) had combined abnormalities in multiple TFT parameters.

Table 2. Distribution of Thyroid Function Test (TFT) Abnormalities

TFT Pattern	n	%
Isolated TSH Derangement	26	50.0%
Isolated T4 Derangement	16	30.8%
Combined TFT Derangements	7	13.5%
Other / Isolated T3 Derangement	3	5.8%
Total	**52**	**100.0%**

Main Results

(a) Association between *Agni* and Thyroid Status: A strong and statistically significant association was found between *Agni* type and thyroid status (Table 3). *Mandagni* was predominantly observed in participants with deranged TSH (69.4%, p<0.001), whereas *Teekshnagni* was strongly associated with deranged T4 (75.0%, p<0.001). No significant association was found between *Agni* type and T3 status (p=0.654).

Table 3. Association between *Agni* Assessment and Thyroid Function Test Status

Thyroid Parameter	*Agni* Type	Deranged n (%)	Normal n (%)	χ^2 Value	p-value
TSH Status	*Mandagni*	**25 (69.4%)**	0 (0.0%)	27.1*	**<0.001**
	Samagni	3 (8.3%)	3 (18.8%)		
	Teekshnagni	4 (11.1%)	12 (75.0%)		
	Vishamagni	4 (11.1%)	1 (6.3%)		
T4 Status	*Mandagni*	0 (0.0%)	**25 (78.1%)**	36.6*	**<0.001**
	Samagni	3 (15.0%)	3 (9.4%)		
	Teekshnagni	**15 (75.0%)**	1 (3.1%)		
	Vishamagni	2 (10.0%)	3 (9.4%)		
T3 Status	*Mandagni*	5 (71.4%)	20 (44.4%)	2.64	0.654
	Samagni	0 (0.0%)	6 (13.3%)		
	Teekshnagni	2 (28.6%)	14 (31.1%)		
	Vishamagni	0 (0.0%)	5 (11.1%)		

Note: *p-value <0.05 by Fisher's exact test is considered statistically significant

(b) *Ama* Scores and *Agni*/Physical Activity: The mean *Ama* score was significantly different across *Agni* types (F=36.3, p<0.001), with the highest score observed in the *Mandagni* group (67.5 ± 6.87). Post-hoc tests confirmed that the *Mandagni* group had significantly higher *Ama* scores than all other *Agni* types (all p<0.01). Furthermore, *Ama* scores varied significantly with physical activity level (F=21.8, p<0.001), with sedentary individuals having the highest scores (66.2 ± 9.85), followed by moderately active (52.4 ± 19.56) and active individuals (37.7 ± 13.91).

(c) Lifestyle Factors and TFTs: Physical activity level had a significant impact on all three thyroid parameters and *Ama* scores (Table 4). Active participants had significantly higher T4 and lower TSH levels compared to sedentary groups. The mean difference in T4 between active and sedentary participants was

4.91 µg/dL (95% CI: 2.92 to 6.90, p<0.001). Similarly, the mean difference in TSH was -10.09 µIU/mL (95% CI: -18.76 to -1.41, p=0.023). *Ama* scores also varied significantly, with sedentary individuals showing the highest scores.

Table 4. Thyroid Function Test Values and Ama Scores by Physical Activity Level (Mean ± SD [95% CI])

Thyroid Function Tests	Active (n=16)	Moderate (n=21)	Sedentary (n=15)	p-value
T3 (0.8-1.8 ng/mL)	1.20 ± 0.16 [1.12, 1.29]	1.08 ± 0.19 [0.99, 1.16]	0.89 ± 0.21 [0.77, 1.00]	**0.010**
T4 (6.09-12.23 µg/dL)	14.52 ± 2.94 [12.93, 16.11]	10.25 ± 2.45 [9.12, 11.38]	9.61 ± 1.95 [8.54, 10.68]	**<0.001**
TSH (0.3-5.6 µIU/mL)	2.52 ± 2.27 [1.31, 3.73]	12.36 ± 12.78 [6.45, 18.27]	12.60 ± 11.43 [6.34, 18.86]	**<0.001**
***Ama* Score**	37.7 ± 13.9 [30.2, 45.2]	52.4 ± 19.6 [43.5, 61.3]	66.2 ± 9.9 [60.7, 71.7]	**<0.001**

**Note*: p-value from one-way ANOVA. 95% CI = 95% Confidence Interval for the mean.*

Correlation Analysis

A Pearson's correlation analysis was conducted to examine linear relationships between continuous variables (Table 5). *Ama* scores showed a weak positive correlation with TSH (r = 0.287, 95% CI: 0.012 to 0.522, p = 0.040) and a weak negative correlation with T4 (r = -0.317, 95% CI: -0.546 to -0.047, p = 0.022). The strong negative correlation between T4 and TSH (r = -0.592, 95% CI: -0.748 to -0.370, p < 0.001) validates the expected physiological feedback loop. **Table 5. Correlation Matrix of Continuous**

Variables (T3, T4, TSH, and *Ama* Score)

Variable	1. T3	2. T4	3. TSH	4. Ama Score
1. T3	—			
2. T4	0.228	—		
3. TSH	-0.193	**-0.592***	—	
4. *Ama* Score	-0.176	**-0.317***	**0.287***	—

**Note:* * p < .05. Values represent Pearson's correlation coefficient (r).*

Other Analyses

Post-hoc analyses of the ANOVA results are provided in the supplementary data. The correlation matrix of continuous variables (T3, T4, TSH, *Ama* Score) did not reveal any strong linear correlations, supporting the use of categorical analyses for the primary objectives. No other subgroup analyses or interactions were tested.

Discussion:

This study highlights a clear and statistically significant relationship between Ayurvedic metabolic markers, specifically *Agni* and *Ama*, and the biochemical indicators of thyroid function, underscoring the deep metabolic interconnection that classical Ayurvedic theory proposes. The prominence of *Mandagni*, a

state denoting reduced digestive intensity, in patients with hypothyroidism not only aligns with decreased metabolic rate observed in biomedical endocrinology but also helps explain the common clinical manifestations of fatigue, weight gain, and sluggishness. This parallel strengthens the argument for *Mandagni* as a conceptual and diagnostic correlate of hypothyroidism within the Ayurvedic tradition. Conversely, *Teekshnagni,* which signifies an increased metabolic state in Ayurveda, was more frequently observed in those with hyperthyroid patterns, characterized by restlessness, unintended weight loss, and heat intolerance. This congruence between *Teekshnagni* and hyperthyroidism further consolidates the value of integrating constitutional digestive assessments into routine thyroid evaluation.

Ama, understood as a pathophysiological mediator in Ayurveda, reflects systemic metabolic inefficiency and manifests as bodily sluggishness and toxin buildup. Its strong correlation with *Mandagni* mirrors the physiological outcomes of low thyroid hormone action, suggesting that individuals with diminished digestive fire are more prone to metabolic stagnation and related symptoms. Lifestyle factors also played a crucial role in this study—greater physical activity correlated with more favorable thyroid function test profiles, reiterating the Ayurvedic emphasis on *Dinacharya* (daily routine) and *Vyayama* (exercise) for maintaining optimal *Agni* and preventing *Ama* formation.

One of the major strengths of this research is how it bridges the diagnostic gap between quantitative biochemical markers (TFTs) and qualitative Ayurvedic assessment tools. While TFTs provide objective evidence of endocrine dysfunction, Ayurveda contextualizes these imbalances within broader patterns of diet, behaviour, and metabolic constitution, offering a multifaceted therapeutic framework. These findings are consistent with prior literature, which emphasizes that *Agnivaishamya* is central to many endocrine disorders—a perspective validated both by classical Ayurvedic modeling and contemporary biomedical research. Overall, this integrative approach not only advances clinical understanding but also paves the way for more personalized and preventive endocrinology.

Strenghts and Limitations:

A notable strength of this study lies in its successful integration of biomedical thyroid testing and Ayurvedic conceptual frameworks, providing a multidimensional assessment that is both rigorous and holistic. By utilizing validated scales for *Agni* and *Ama* evaluation alongside quantitative thyroid hormone measurements, the research creates a bridge between modern diagnostics and traditional Indian medicine. However, several limitations must be acknowledged. The relatively small sample size of 52 participants curtails the generalizability and the statistical power needed for subgroup analysis or more granular modeling. The retrospective, observational design, while methodologically sound for initial exploration, restricts causal inference compared to prospective, randomized studies. Moreover, the use of telephonic questionnaires, though practical, precluded more nuanced Ayurvedic examinations such as *Nadi Pariksha* and direct *darshana*, which might yield deeper insight. This research was limited to select Ayurvedic constructs—primarily *Agni*, *Ama*, and lifestyle—without evaluating other relevant domains such as *Dhatu Dushti* or psychological factors, possibly omitting significant aspects of the disease experience. Finally, as a single-center study based within one Ayurvedic hospital, external validity and applicability to broader populations remain limited until these findings are confirmed in diverse and multicentric cohorts.

Conclusion:

This retrospective study bridges the conceptual framework of Ayurveda with modern endocrinology, demonstrating that derangements in *Agni* and *Ama* correspond closely with biochemical thyroid

dysfunction. *Mandagni* correlates with hypothyroidism, while *Teekshnagni* parallels hyperthyroidism, affirming *Agnivaishamya* as the root of thyroid imbalance and *Ama* serves as holistic indicator of metabolic inefficiency.

By adopting an integrative diagnostic perspective, clinicians can achieve a multidimensional understanding of thyroid dysfunction, blending biochemical precision with Ayurvedic wisdom. Such synergy may guide personalized interventions encompassing diet, lifestyle, and herbal management, ultimately improving patient outcomes.

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