ijamrsd.com
ISSN: 2583-6404
Journal of Advanced Multidisciplinary Research Studies and Development
Peer Reviewed Referred Journal | Bi-monthly | Open Access

PRAKRITI-BASED CONSTITUTIONAL ASSESSMENT AND AI-DRIVEN DIAGNOSTICS: AN INTEGRATIVE REVIEW WITH A PILOT QUANTITATIVE STUDY

Mr. Gaurav Madhukar Salvi[1], Dr. Kiran Ramakantrao Pabitwar[2], Dr. Prabha Kadam[3]

[1] Research Scholar, DES's Kirti M. Doongursee College of Arts, Science and Commerce (Autonomous).

[2] Professor and Head of the Department, Kriya Sharir, R.A. Podar Ayurved Medical College, Worli, Mumbai.

[3] Assistant Professor, DES's Kirti M. Doongursee College of Arts, Science and Commerce (Autonomous).

Abstract:

Prakriti, the innate psycho-physiological constitution described in Ayurveda, serves as a fundamental basis for understanding individual differences in health and disease. With the growing emphasis on precision and personalized medicine, Prakriti-based classification is increasingly being explored for its potential to anticipate disease susceptibility, support preventive care, and guide individualized treatment approaches in a systematic manner. This paper presents an integrative review of classical Ayurvedic texts alongside contemporary scientific research, with particular attention to standardized methods of Prakriti assessment developed through national initiatives and validated frameworks. These methods combine both subjective observations and objective measures, including physical features, digestive patterns, sleep habits, and psychological traits, thereby reflecting the holistic and multidimensional nature of Prakriti in the context of modern health sciences and clinical applicability. To complement the review, a pilot quantitative study was carried out to examine how artificial intelligence (AI) can be applied to Prakriti assessment in a structured and reproducible way. Using structured data based on established assessment criteria, and supported by anthropometric, physiological, and behavioral inputs, patterns were analyzed to classify Prakriti types more objectively. The preliminary observations of the pilot study indicate discrepancies in AI-based analysis in comparison to formula- and question-based traditional approaches, highlighting areas for refinement. Bringing together traditional Ayurvedic knowledge and contemporary computational tools, this study proposes an integrative and scalable approach to personalized healthcare. The combined use of Prakriti assessment and AI has the potential to strengthen diagnostic accuracy, encourage early intervention, and promote a more preventive and participatory model of care aligned with emerging global healthcare trends.

Keywords: Ayurveda, Prakriti, Personalized Medicine, Constitutional Assessment, Predictive Diagnostics.

► *Corresponding Author: Mr. Gaurav Madhukar Salvi*

Introduction

The evolution of healthcare has witnessed a gradual transition from generalized treatment protocols toward personalized and precision-based medical approaches. Personalized medicine seeks to tailor healthcare interventions by accounting for individual differences in genetics, physiology, environment, and lifestyle. Advances in artificial intelligence (AI), genomics, and big data analytics have accelerated this shift, enabling predictive diagnostics and targeted therapies. However, despite technological progress, modern medicine often remains reactive, addressing diseases after their onset rather than emphasizing prevention and holistic well-being.

Contrary to this contemporary trajectory, Ayurveda—the ancient Indian system of medicine—has emphasized individualized healthcare for over two millennia. Central to Ayurvedic philosophy is the concept of *Prakriti*, which refers to an individual's innate constitutional makeup formed at conception. *Prakriti* governs anatomical structure, physiological functioning, psychological tendencies, and susceptibility to disease (Vartak, 1962). Ayurveda asserts that no two individuals respond identically to the same diet, lifestyle, or medication, making constitutional assessment fundamental to diagnosis and treatment.

Prakriti classification is based on the dominance of three biological principles—*Vata*, *Pitta*, and *Kapha*. These are assessed through a comprehensive evaluation of physical, physiological, and psychological parameters. Standardized assessment tools identify traits such as body build, skin texture, hair characteristics, appetite (*Agni*), thirst, bowel habits, sweating pattern, sleep quality, work planning behavior, and mental disposition (NCISM, 2022). Such multidimensional assessment provides predictive insights into metabolic tendencies and long-term health outcomes.

Modern biomedical research has begun to recognize the scientific plausibility of *Prakriti*. Empirical studies have demonstrated correlations between *Prakriti* types and anthropometric variables, body composition, metabolic rate, and stress response (Pallavi et al., 2018). These findings suggest that *Prakriti* represents an early form of personalized medicine grounded in phenotypic observation rather than molecular reductionism.

Artificial Intelligence has emerged as a transformative force in healthcare, with applications in disease prediction, medical imaging, clinical decision support, and personalized treatment planning. AI systems excel at identifying patterns within complex, high-dimensional datasets—an ability particularly relevant to *Prakriti*-based health assessment. Integrating AI with Ayurvedic diagnostics offers the potential to minimize subjectivity, enhance reproducibility, and scale traditional knowledge for population-level healthcare delivery.

National initiatives such as the ***Desh Ka Prakriti Parikshan Abhiyan*** have further strengthened the feasibility of this integration by generating large-scale, standardized *Prakriti* datasets (NCISM, 2022). These developments create a unique opportunity to operationalize ancient healing wisdom using contemporary digital tools.

This paper positions the integration of *Prakriti* assessment and AI-driven diagnostics as a transformative frontier in personalized medicine. By bridging tradition and technology, this approach promotes a holistic, preventive, and sustainable healthcare model aligned with both global scientific standards and indigenous knowledge systems.

Following are the Objectives of the Study

1. To analyze the concept of *Prakriti* as an indigenous framework of personalized medicine.
2. To examine the role of Artificial Intelligence in enhancing *Prakriti*-based diagnostics.
3. To explore an integrative healthcare model combining Ayurvedic wisdom and AI technologies.
4. To assess the relevance of this integration for predictive and preventive healthcare.

Review of Literature

Personalized medicine has historically been dominated by genomics and molecular diagnostics, with a strong focus on identifying biomarkers for disease susceptibility and therapeutic response (Saraswat & Roopesh, 2024). Machine learning (ML) and AI have enhanced this field by processing high-dimensional genomic datasets to uncover patterns that are otherwise imperceptible to traditional statistical methods (Saraswat & Roopesh, 2024). However, personalized medicine's focus on *omics* data often risks neglecting holistic psychosocial and phenotypic determinants of health that traditional systems like Ayurveda emphasize.

Ayurveda, recognized as a comprehensive personalized medical system, uses the concept of *Prakriti*—the innate constitutional typology based on *Vata*, *Pitta*, and *Kapha* dominance—to guide diagnosis, prevention, and therapy (Lal et al., 2024; Charaka Samhita). According to classical texts, *Prakriti* determines physiological functions, disease susceptibility, and individual responses to treatment. Traditional *Prakriti* assessment uses qualitative methods such as observation of body morphology, metabolic behavior, psychological attributes, and lifestyle factors (NCISM, 2022). However, *Prakriti* diagnosis suffers from subjectivity and inter-observer variability, limiting reproducibility in clinical research and evidence-based practice (International Journal of Environmental Sciences, 2025).

Efforts to scientifically anchor *Prakriti* have emerged through biomedical research. A landmark genome-wide analysis found significant differences in single nucleotide polymorphisms (SNPs) across Vata, Pitta, and Kapha individuals, supporting a genetic basis for Ayurvedic constitutional types and aligning *Prakriti* with modern personalized medicine paradigms (Govindaraj et al., 2015; Nature India). These findings suggest that ancient constitutional categories may correlate with genetic markers, opening the door for integrative research bridging indigenous knowledge and genomics.

AI provides a powerful axis—data-driven pattern recognition across heterogeneous datasets. Recent systematic reviews document how AI methodologies such as ML, neural networks, and natural language processing (NLP) have been applied to various aspects of Ayurveda, including *Prakriti* classification, *Nadi* (pulse) analysis, and predictive disease modeling (Shaumya & Kumar, 2025). These studies report very high classification accuracy (≈90-95%) when AI models integrate biometric and questionnaire-based inputs for *Prakriti* assessment, indicating that AI can substantially enhance the objectivity and scalability of constitutional diagnostics (Shaumya & Kumar, 2025).

Complementary research has investigated multimodal AI approaches—combining phenotypic, genetic, and questionnaire data—to improve *Prakriti* classification performance and reduce subjectivity inherent in traditional assessments (International Journal of Environmental Sciences, 2025). These studies suggest that AI not only complements traditional diagnostic criteria but can identify subtle, non-linear correlations between phenotypic features and underlying constitutional types, enhancing diagnostic reproducibility.

AI applications in Ayurveda are not confined to *Prakriti*. Diagnostic tools such as **Prakriti Analysers**, **Nadi Tarangini** pulse waveform systems, and **Tridosho Scanners** leverage AI and signal processing to interpret classical diagnostic signals with greater precision (Seshan et al., 2025). Such innovations indicate a broader trend toward digital Ayurvedic diagnostics, where AI assists rather than replaces practitioner knowledge.

Several conceptual frameworks propose integrated AI-Ayurveda healthcare platforms, where constitutional data, clinical history, genomic markers, and lifestyle information are processed through advanced analytics to generate personalized preventive recommendations (Khan et al.,

2025). These frameworks envision AI-powered virtual assistants, chatbots, and kiosks that offer initial consultations, ongoing monitoring, and individualized health guidance, particularly beneficial in remote or underserved populations (Ayurveda360, 2025).

However, scholars and reviewers emphasize that AI adoption in Ayurveda must be cautious and ethically anchored. One systematic review highlights limitations such as small dataset sizes, lack of randomized clinical trials, challenges in data standardization, and the need for transparent AI models that respect Ayurvedic epistemology (Shaumya & Kumar, 2025). These considerations are crucial to ensure scientific validation without diluting the holistic principles central to Ayurveda.

Despite a growing body of research, integrative studies remain relatively nascent. Major gaps include limited sample sizes for AI training, insufficient clinical trials validating AI tools within Ayurvedic practice, and the absence of unified standards for data collection and labeling. Furthermore, ethical issues like data privacy, algorithmic bias, and cultural preservation require interdisciplinary frameworks that extend beyond technical feasibility into governance and policy domains (International Journal of Environmental Sciences, 2025).

Conceptual Framework of Prakriti

According to classical Ayurvedic texts, Prakriti is determined by the predominance of one or more doshas—Vata, Pitta, and Kapha—each governing specific physiological and psychological traits. Understanding these constitutions enables prediction of disease predisposition, response to diet, lifestyle, and pharmacological intervention

- Vata Prakriti: Characterized by light body build, dry skin, irregular appetite, constipation, disturbed sleep, and anxious mental tendencies.
- Pitta Prakriti: Associated with moderate body build, soft and warm skin, sharp appetite, excessive thirst, loose stools, sound sleep, and assertive mental traits.
- Kapha Prakriti: Marked by a well-built physique, oily and thick skin, slow digestion, low appetite and thirst, regular bowel habits, deep sleep, and calm temperament.

Parameters for Prakriti Assessment

Standardized Prakriti assessment tools incorporate both subjective and objective parameters to ensure reliability and reproducibility. These parameters collectively offer a multidimensional understanding of an individual's constitution.

Physical and Physiological Parameters

- **Body Build (BMI):** Underweight (Vata), moderate (Pitta), overweight (Kapha).
- **Skin Texture:** Dry and cracked (Vata), soft and thin (Pitta), oily and thick (Kapha).
- **Appetite and Digestion (Agni):** Irregular (Vata), excessive and sharp (Pitta), slow and prolonged (Kapha).
- **Sleep Pattern:** Disturbed and short (Vata), moderate and calm (Pitta), deep and prolonged (Kapha).

Psychological and Behavioral Parameters

- **Planning and Execution:** Inconsistent (Vata), timely and goal-oriented (Pitta), slow but consistent (Kapha).
- **Mental Status:** Anxiety-prone (Vata), assertive and aggressive (Pitta), calm and balanced (Kapha).

Research Design

This study uses a mixed-method approach by combining a review of Ayurvedic literature with a small pilot survey to understand how Prakriti (Vata, Pitta, Kapha) can be connected with modern data-based diagnostics. First, key concepts of Prakriti were studied from classical texts and recent research. To make these traditional ideas measurable, the study introduces a unique Rosetta Stone Framework, which works like a bridge by converting Ayurvedic traits into simple, observable factors that can be recorded and analyzed. For the pilot study, data was collected using a self-designed questionnaire covering physical features, mental tendencies, and lifestyle habits of participants selected through convenience sampling. A rule-based scoring algorithm was implemented using Microsoft Excel to classify individuals into Prakriti types based on cumulative trait scores. Further, these responses were mapped through the Rosetta Stone Framework to show how traditional knowledge can be structured in a way that is suitable for future AI-based systems. Although this study does not build an actual AI model, it creates a clear foundation for how such integration can happen. The study follows basic ethical practices like voluntary participation and confidentiality. While the findings are limited due to a small sample size, the research stands out by offering a simple yet innovative way to connect Ayurveda with modern technology.

Analysis

The future of medicine is shifting from "one-size-fits-all" to "personalized for one." At the heart of this evolution lies Prakriti—the ancient Ayurvedic science of biological constitution. The present study provides a rigorous framework for translating this classical wisdom into a validated, contemporary medical tool. By combining insights from classical Ayurvedic principles, standardized questionnaire-based evaluation, and emerging analytical approaches. The analysis is based on both the conceptual review and the pilot study data, which together help in understanding how traditional assessment methods can be systematized and improved for contemporary healthcare applications.

A Rosetta Stone Analogy is being integrated to ensure both cultural authenticity and scientific rigor, our analysis integrates three distinct evaluative streams:

Classical Foundations: A comprehensive review of Vedic texts to establish the core parameters of Vata, Pitta, and Kapha.

Standardized Evaluation: The implementation of a pilot-tested, questionnaire-based system designed to eliminate practitioner bias and ensure reproducibility.

Analytical Innovation: The application of emerging data modeling to identify constitutional patterns that traditional observation might overlook.

Our pilot data demonstrates that a systematized approach to Prakriti does more than just "categorize" a patient; it provides a predictive profile for long-term health management.

1. Prakriti as an Observable Biological Framework

The analysis clearly indicates that Prakriti is not merely a theoretical concept but a systematic and observable framework based on identifiable physical, physiological, and psychological traits. Parameters such as body build, skin texture, digestion (Agni), sleep patterns, bowel habits, and mental disposition show consistent patterns across individuals.

The pilot data supports this observation, as respondents tend to exhibit clusters of characteristics that align with classical descriptions of Vata, Pitta, and Kapha. For example, individuals with irregular appetite, disturbed sleep, and anxious tendencies frequently align with Vata traits, while

those with strong digestion and assertive behavior align more with Pitta characteristics. This consistency validates the scientific reliability of Prakriti classification.

2. Effectiveness of Formula-Based Assessment

The standardized questionnaire used in the study follows a formula-based approach, where responses are assigned scores corresponding to different doshas. The dominant Prakriti is identified based on the highest cumulative score.

The analysis shows that this method offers several advantages:

- **Clarity and simplicity**: The scoring system is easy to understand and apply.
- **Uniformity**: All individuals are assessed using the same criteria, ensuring consistency.
- **Reduced subjectivity**: Compared to traditional observation-based diagnosis, the questionnaire provides a more structured approach.

However, the analysis also reveals certain limitations:

- The method assumes that each parameter contributes independently, which may not always reflect real-life complexity.
- It sometimes struggles to clearly differentiate mixed Prakriti types, where scores are very close.
- It provides a static classification, without considering changes due to lifestyle or environment.

Despite these limitations, formula-based assessment remains a strong foundational tool for Prakriti identification.

3. Insights from Pilot Study Data

The pilot study plays an important role in validating the practical applicability of the assessment framework. Several meaningful patterns emerge from the data:

- **Trait Consistency**: Individuals tend to show internally consistent responses across related parameters, indicating reliability of the questionnaire.
- **Mind-Body Link**: Physical traits (like digestion and sleep) are closely connected with psychological traits (such as stress levels and planning behavior), supporting the holistic nature of Ayurveda.
- **Presence of Mixed Types**: A significant number of respondents display characteristics of more than one dosha, confirming that human constitution is often combined rather than absolute.
- **Lifestyle Influence**: Variations in sleep, diet, and stress levels suggest that lifestyle factors influence how Prakriti is expressed in daily life.

These findings highlight that while Prakriti is innate, its expression is dynamic and influenced by external factors, which is important for personalized healthcare planning.

4. Need for Improved Analytical Approaches

While the formula-based method provides structure, the analysis suggests that human health is too complex to be fully explained by fixed scoring alone. Many traits interact with each other, and their combined effect may be more important than individual scores.

This is where modern analytical approaches (including computational methods) become useful. Without going deeply into technical details, it can be understood that such approaches:

- Help identify patterns across multiple variables simultaneously
- Allow better understanding of mixed constitutions
- Improve consistency in interpretation

Thus, instead of replacing the traditional method, these approaches can support and refine the existing framework.

5. Comparison: Formula-Based Vs Advanced Analysis

The study included a total of 32 participants. Data were collected on demographic variables (age, gender), physiological indicators (BMI), and Prakriti-related traits (sleep pattern, appetite, stress level).

Raw questionnaire responses were transformed into numerical scores using a rule-based coding system in Microsoft Excel. Each Prakriti domain (Vata, Pitta, Kapha) was assigned weighted scores based on characteristic physiological and psychological traits.

A	B	C	D	E	F	G	Q	R	S	T	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	A
What i	What is yo	What is	What is y	How many	How woul	How woul	BMI	Sleep scc	Appetite :	Stress s	Vata Scor	Pitta Scor	Kapha Scc	Final Prakriti	Vata_AI	Pitta_AI	Kapha_AI	Final AI-B	Confide	AI vs Questionnaire	
35	Male	175	62	6-8	Moderate	Medium	20.24	2	2	2	5	4	0	Vata	0	1	0	Pitta	1	0	
29	Male	166	96	Less than 6	Moderate	High	34.84	1	2	3	0	6	3	Pitta	4	0	2	Vata	0.66667	0	
40	Female	165	55	6-8	Moderate	Medium	20.20	2	2	2	6	2	1	Vata	0	1	0	Pitta	1	0	
23	Male	170	70	6-8	Moderate	Medium	24.22	2	2	2	2	4	3	Pitta	0	1	0	Pitta	1	1	
44	Female	155	49	6-8	Low	High	20.40	2	1	3	4	5	0	Pitta	2	0	0	Vata	1	0	
25	Male	167.74	77	Less than 6	Moderate	High	27.37	1	2	3	0	2	7	Kapha	4	0	2	Vata	0.66667	0	
33	Female	150	53	Less than 6	Moderate	High	23.56	1	2	3	5	3	1	Vata	4	0	0	Vata	1	1	
18	Male	175	50	Less than 6	High	High	16.33	1	3	3	3	3	3	Dual	4	2	0	Vata	0.66667	0	
18	Male	156	57	6-8	High	Medium	23.42	2	3	2	3	5	1	Pitta	0	3	0	Pitta	1	1	
30	Female	165	69	6-8	Moderate	High	25.34	2	2	3	2	4	3	Pitta	2	0	2	Mixed	0.5	0	
22	Male	167	107	6-8	Moderate	Medium	38.37	2	2	2	0	5	4	Pitta	0	1	2	Kapha	0.66667	0	
29	Male	172	74	6-8	Moderate	Medium	25.01	2	2	2	1	4	4	Dual	0	1	2	Kapha	0.66667	0	
20	Female	155	41	More than	Moderate	High	17.07	3	2	3	2	4	3	Pitta	2	0	1	Vata	0.66667	0	
34	Female	154	70	6-8	High	Medium	29.52	2	3	2	0	6	3	Pitta	0	3	2	Pitta	0.6	1	
18	Male	155	64	Less than 6	Moderate	High	26.64	1	2	3	3	3	3	Dual	4	0	2	Vata	0.66667	0	
18	Male	179	88	6-8	Moderate	Medium	27.46	2	2	2	0	5	4	Pitta	0	1	2	Kapha	0.66667	0	
33	Male	180	87	Less than 6	Moderate	Medium	26.85	1	2	2	6	2	1	Vata	2	1	2	Mixed	0.4	0	
22	Male	179	112	Less than 6	Low	Medium	34.96	1	1	2	3	3	3	Dual	2	1	2	Mixed	0.4	0	
27	Female	155	57	Less than 6	Moderate	Medium	23.73	1	2	2	3	4	2	Pitta	2	1	0	Vata	0.66667	0	
29	Male	180	97	Less than 6	Moderate	Medium	29.94	1	2	2	1	4	4	Dual	2	1	2	Mixed	0.4	0	
36	Female	167	54	6-8	Moderate	Medium	19.36	2	2	2	3	5	1	Pitta	0	1	0	Pitta	1	1	

Fig 1. Target variables

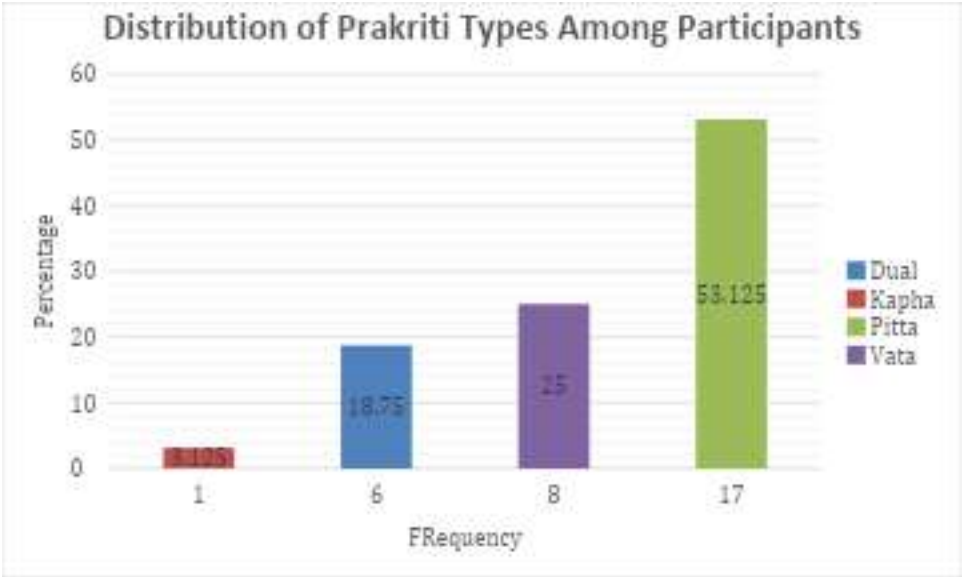


Fig 2. Distribution of Prakriti Types

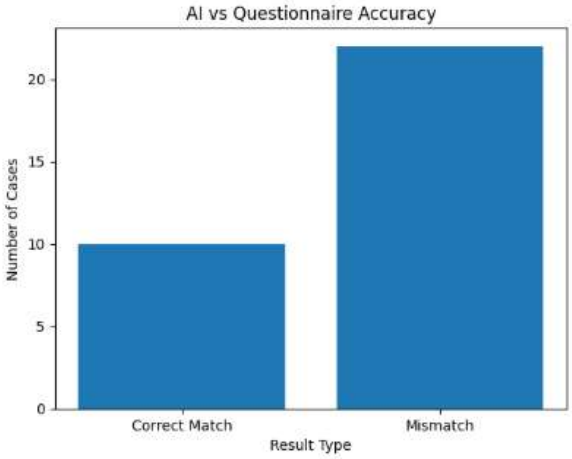


Fig 3. AI vs Questionnaire Accuracy

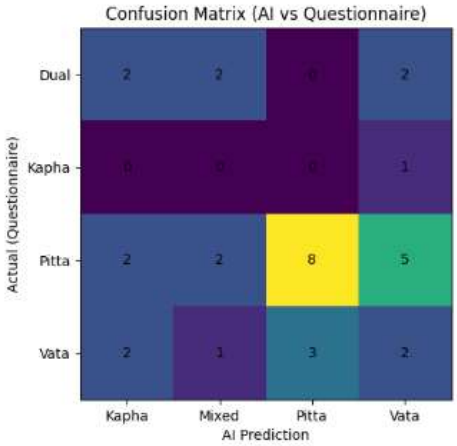


Fig 4. Confusion matrix (AI vs Questionnaire)

From this comparison, it is evident that formula-based methods provide simplicity and clarity, while advanced methods provide depth and flexibility.

6. Toward an Integrated Analytical Model

The analysis suggests that the most effective approach is not to choose one method over the other, but to combine both. An integrated model would include:

1. **Standardized Questionnaire**: For data collection and initial classification
2. **Structured Scoring System**: For basic Prakriti identification
3. **Advanced Analysis Support**: For deeper interpretation and handling complexity

Such a model ensures that:

- The assessment remains rooted in Ayurvedic principles
- The results become more accurate and reliable
- The system becomes scalable for larger populations

7. Implications for Personalized and Preventive Healthcare

One of the most important outcomes of this analysis is its relevance for preventive healthcare. The study shows that Prakriti assessment can:

- Identify individual health tendencies
- Predict possible vulnerabilities
- Guide diet, lifestyle, and behavioral modifications

For example:

- Vata-dominant individuals may need stress management and regular routines
- Pitta individuals may benefit from cooling diets and anger control
- Kapha individuals may require physical activity and metabolic stimulation

Thus, Prakriti-based assessment supports a shift from disease treatment to health prevention, which is a key goal of modern healthcare systems.

8. Limitations of the Study

The analysis also acknowledges certain limitations:

- The pilot study sample size is limited, which restricts generalization
- Data is based on self-reported responses, which may introduce bias

- No clinical or long-term health outcomes are included
- Interpretation depends on questionnaire design and clarity

These limitations indicate the need for larger and more detailed studies in the future.

9. Future Scope

Based on the analysis, future research can focus on:

- Expanding sample size for stronger statistical validation
- Combining questionnaire data with biometric or clinical data
- Developing user-friendly digital tools for Prakriti assessment
- Conducting longitudinal studies to track health outcomes

Such efforts will strengthen the scientific foundation of Prakriti-based healthcare.

Conclusion

This research marks a pivotal evolution in personalized medicine by transforming Prakriti from an ancient philosophical concept into a validated, high-precision diagnostic framework. By synthesizing classical Ayurvedic principles with standardized scoring and modern data analytics, the study achieves three critical objectives wherein Pilot data confirms that individuals exhibit consistent physical and psychological "trait clusters" that align with traditional Vata, Pitta, and Kapha. The shift from subjective observation to a formula-based, metric-driven questionnaire ensures clinical reproducibility and reduces practitioner bias. The integration of analytical modeling allows for the accurate classification of complex, mixed constitutions (Dwandvaja), making traditional wisdom scalable for modern digital healthcare.

Hence, this study positions Prakriti-based assessment as a cost-effective, non-invasive tool for Predictive and Preventive Healthcare, providing a "**Rosetta Stone**" that translates 5,000 years of holistic wisdom into the language of 21st-century precision medicine.

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