ROLE OF RITUCHARYA IN CLIMATE CHANGE ADAPTATION: AN AYURVEDIC PERSPECTIVE

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ABSTRACT

Background: Anthropogenic climate change is altering the frequency, intensity, and predictability of seasonal weather patterns, with documented consequences for heat-related mortality, vector-borne and emerging infectious disease, air-quality-linked cardiorespiratory illness, and population resilience. Ayurveda has, for over two millennia, articulated a systematic seasonal adaptive framework — Ritucharya — that prescribes season-specific modification of diet, lifestyle, and conduct across six recognised seasons (Ritus), explicitly anticipating that failure to adapt to seasonal change (RituVaishamya) predisposes to disease.

Objective: To critically examine the classical AyurvedicRitucharya framework as a model of human seasonal adaptation and to evaluate its conceptual and practical relevance to contemporary climate-change health adaptation and planetary-health discourse.

Review Methodology: A narrative review was conducted using PubMed, Scopus, Google Scholar, the AYUSH Research Portal, and DHARA, supplemented by classical sources (Charaka Samhita, Sushruta Samhita, AshtangaHridaya), combined with contemporary climate-health literature from WHO, UN, and peer-reviewed journals, largely from 2015–2026.

Key Findings: Classical Ritucharya anticipates several mechanisms now independently described in climate-health science, including heat-adaptive dietary and behavioural modification during Grishma (summer), immunity-focused seasonal transition (Ritusandhi) practices resembling contemporary seasonal-immunity concerns around vector-borne and respiratory disease, and explicit recognition that atypical seasonal patterns (Atiyoga, Ayoga, Mithya Yoga) — conceptually analogous to climate-change-driven seasonal anomaly — heighten disease risk. Modern literature independently documents rising heat-related mortality, an expanding range for vector-borne disease, and growing cardiorespiratory burden from climate-linked air pollution, all converging on the same broad protective themes **Ritucharyaaddresses:** hydration and thermoregulatory behaviour, immune-supportive seasonal transition practices, and anticipatory rather than purely reactive adaptation.

Conclusion: Ritucharya constitutes a historically validated conceptual precedent for climate-health adaptation that merits structured integration into contemporary planetary-health and One Health frameworks, while direct empirical evaluation of Ritucharya-based interventions against climate-sensitive health outcomes remains an open research need.

Practical Implications: Ritucharya-based seasonal health messaging could complement WHO/AYUSH heat-action and seasonal-preparedness programmes, particularly in South Asian settings where the framework carries strong cultural resonance and low implementation cost.

Keywords: Ritucharya; Climate change adaptation; Seasonal regimen; Ayurveda; Planetary health; One Health; Heat stress; Seasonal immunity

1. INTRODUCTION

Climate change is now unambiguously affecting human health through multiple, interacting pathways. WHO estimates that between 2030 and 2050 climate change will cause approximately 250,000 additional deaths annually from malnutrition, malaria, diarrhoeal disease, and heat stress, with direct health-system costs projected between USD 2-4 billion per year.[1] Heat-related mortality among adults over 65 years rose by approximately 85% between the 2000-2004 and 2017-2021 periods, and an estimated 489,000 heat-related deaths occur annually worldwide, disproportionately concentrated in Asia and Europe.[2] Air pollution, itself intertwined with climate change through shared fossil-fuel combustion sources, contributed to over 8.1 million deaths globally in the most recent Global Burden of Disease analyses, predominantly through cardiovascular and respiratory

pathways.[3,4]

Global Relevance: These impacts are not uniformly distributed. Low- and middle-income countries — including large parts of South Asia — bear a disproportionate share of climate-sensitive disease burden due to greater outdoor occupational exposure, weaker health-system heat-preparedness, and higher baseline burden of infectious and cardiometabolic disease.[3,5] Extreme heat alone reduced global labour capacity by an estimated USD 1.09 trillion in 2024.[1]

Need for Adaptive Preventive Healthcare: Contemporary climate-health strategy increasingly emphasises anticipatory adaptation — building resilience and behavioural preparedness ahead of seasonal extremes — rather than purely reactive emergency response. The World Economic Forum's Climate & Health initiative and the emerging One Health movement both foreground integrated, ecosystem-aware, anticipatory frameworks for managing climate-linked health risk.[5,6] Ayurveda's Ritucharya (ritu = season; charya = regimen/conduct) is, in essence, a two-millennia-old anticipatory seasonal health framework, prescribing specific dietary, behavioural, and lifestyle modification in advance of and during each of six recognised Indian seasons, explicitly to prevent the disease that predictable seasonal change would otherwise provoke.[7,8]

Research Gap: While Ritucharya has been extensively described within Ayurvedic literature as a preventive framework for classical seasonal disease, its explicit conceptual mapping onto contemporary climate-change adaptation science — heat-health action planning, seasonal-immunity strategy, and planetary-health/One Health discourse — remains comparatively underdeveloped. This review addresses that gap by systematically juxtaposing the classical Ritucharya framework against current climate-health evidence.

2. OBJECTIVES

- To synthesise the classical Ritucharya framework as described in the Brihattrayi, including its response to seasonal anomaly (RituVaishamya).
- To map Ritucharya's seasonal principles onto contemporary climate-change health domains: heat stress, air pollution, vector-borne/emerging infectious disease, and seasonal immunity.
- To critically evaluate Ritucharya's relevance to planetary health, One Health, and public-health climate-adaptation strategy.
- To propose research directions and practical recommendations for integrating Ritucharya-informed messaging into climate-health adaptation programmes.

3. METHODOLOGY

Databases Searched: PubMed, Scopus, Google Scholar, the AYUSH Research Portal, and DHARA, together with WHO, UN, and World Economic Forum publication repositories for climate-health data.

Search Strategy: Boolean combinations of "Ritucharya", "seasonal regimen Ayurveda", "climate change health", "heat stress", "air pollution health", "vector-borne disease climate", "planetary health", "One Health", and "seasonal immunity", cross-referenced with classical seasonal terms (Grishma, Varsha, Sharad, Hemanta, Shishira, Vasanta, Ritusandhi).

Inclusion Criteria: Peer-reviewed reviews and primary studies on climate-health impacts (2015-2026, prioritising 2020-2026), WHO/UN technical reports, and classical Ayurvedic textual sources in standard published editions/translations.

Exclusion Criteria: Non-peer-reviewed promotional web content (used only for background orientation), duplicate records, and sources lacking extractable relevance to seasonal or climate-health mechanisms.

Time Period: Classical sources — standard published editions of the Brihattrayi. Contemporary sources — principally 2015-2026.

4. CLASSICAL AYURVEDIC REVIEW

The Charaka Samhita's TasyashiteeyaAdhyaya (Sutra Sthana, Chapter 6) provides the foundational classical description of Ritucharya, organising the year into two Ayanas (solstitial phases) — Uttarayana (Adana Kala, the "period of withdrawal", when the sun and wind progressively strengthen and deplete bodily strength and the earth's cooling qualities) and Dakshinayana (Visarga Kala, the "period of release", when the moon's cooling influence predominates and bodily strength is progressively restored) — each comprising three of the six Ritus.[7,9]

4.1 The six Ritus and their classical characterisation

- Shishira (Late Winter) — cold, dry; Uttarayana; Kapha accumulation begins.
- Vasanta (Spring) — mild warming; Uttarayana; KaphaPrakopa (aggravation) and subsequent liquefaction.
- Grishma (Summer) — intense heat; Uttarayana; peak bodily strength depletion (Adana), VataSanchaya begins.
- Varsha (Monsoon/Rainy) — humidity, sourness of environment; Dakshinayana begins; VataPrakopa, Pitta Sanchaya.
- Sharad (Autumn) — clearing skies, residual heat; Dakshinayana; Pitta Prakopa.
- Hemanta (Early Winter) — cold, dry; Dakshinayana; peak bodily strength (Visarga), KaphaSanchaya begins.

For each Ritu, the classics prescribe specific Ahara (diet), Vihara (lifestyle), and Sadvritta (conduct) modifications — for example, cooling, hydrating, easily digestible food and avoidance of peak-heat exertion during Grishma; light, easily digestible, well-cooked food and caution regarding water

sources during Varsha; and unctuous, calorie-dense food supporting Agni during Hemanta, when digestive strength is classically held to be at its annual peak.[7,8]

4.2 Ritusandhi and seasonal anomaly (RituVaishamya)

The classics specifically address the transitional period between seasons (Ritusandhi, approximately a fortnight, per Charaka; sixteen days, Yamadrastha, per Sarangadhara), during which the regimen of the outgoing season is gradually withdrawn and that of the incoming season gradually adopted, rather than switched abruptly — a principle intended to minimise physiological shock at seasonal transition.[10,11] Ayurveda further explicitly names three patterns of seasonal anomaly: Atiyoga (excessive expression of seasonal qualities, e.g., excess heat), Ayoga (deficient expression, e.g., absent monsoon rain), and Mithya Yoga (distorted/inverted expression, e.g., rain during winter) — each classically associated with heightened disease incidence, an anticipatory conceptual analogue to what is now termed climate variability and seasonal disruption.[12]

5. CONCEPTUAL FRAMEWORK

Ritucharya rests on the premise that the human body (Pinda) is a microcosm of the macrocosm (Brahmanda) and is therefore continuously responsive to external environmental change (RituParinama). Health, in this framework, is not a static state but a dynamic equilibrium (Swasthya) actively maintained through anticipatory adjustment of diet, activity, and conduct in step with predictable seasonal transformation — a formulation that anticipates the modern concept of allostasis (adaptive physiological adjustment to environmental demand) and the broader ecological framing of health found in planetary-health science.[8,13]

The explicit classical recognition that anomalous seasons (Atiyoga/Ayoga/Mithya Yoga) elevate disease risk provides a direct conceptual precedent for climate-change health adaptation science, which is likewise concerned with health consequences of altered seasonal predictability, intensified heat extremes, and shifted precipitation patterns — the modern equivalent of RituVaishamya operating at a planetary rather than an annual-local scale.[12,13]

6. MODERN SCIENTIFIC CORRELATION

6.1 Heat stress and thermoregulatory adaptation

WHO data show that heat-related mortality is rising sharply, with approximately 489,000 annual deaths (2000-2019 average) and a documented 85% rise in heat-related mortality among older adults between 2000-2004 and 2017-2021.[2] Heat exposure produces cardiovascular strain, dehydration, heat exhaustion/stroke, and worsens respiratory and renal disease.[2,14] The Grishma-Ritu prescriptions of cooling, easily digestible, hydrating diet; avoidance of peak-heat exertion; and lighter clothing directly anticipate current heat-action-day guidance issued by WHO and public-health authorities.[6,14]

6.2 Air pollution and cardiorespiratory disease

Ambient air pollution, exacerbated by the same fossil-fuel combustion driving climate change, was responsible for an estimated 8.1 million deaths globally in recent analyses, with cardiovascular causes predominating; the World Heart Federation's 2024 report specifically documents air-pollution-attributable cardiovascular burden rising in low- and middle-income countries, including South Asia.[3,4,15,16] Ayurvedic seasonal guidance regarding Sharad-Ritu (when Pitta aggravation and residual environmental heat/pollutant load are classically emphasised) recommends specific dietary cooling and detoxification (Virechana-based Panchakarma in eligible individuals) practices that parallel contemporary interest in seasonal cardiorespiratory risk mitigation, although direct trial evidence for these specific Ayurvedic interventions against air-pollution outcomes is not yet available.[8]

6.3 Vector-borne and emerging infectious disease

Climate change is documented to be expanding the geographic and seasonal range of vector-borne diseases such as malaria and dengue as warming temperatures extend vector habitats and breeding seasons.[17] Varsha-Ritu (monsoon) guidance in classical Ritucharya — emphasising boiled/purified water, avoidance of stagnant-water exposure, and immune-supportive light diet — anticipates precisely the transmission pathways now described for climate-sensitive vector-borne and water-borne disease, even though the classical texts frame the mechanism in terms of Dosha vitiation rather than vector biology.[7,17]

6.4 Planetary health, One Health, and ecosystem-linked adaptation

Recent planetary-boundaries literature documents that breaching multiple ecological thresholds simultaneously (climate, freshwater, biodiversity) compounds human-health risk through interacting pathways rather than single-hazard exposure.[13] The One Health movement, formally foregrounded around emerging climate-health crises since 2024, explicitly calls for integrated strategies addressing the interconnection of human, animal, and environmental health — a systems-level orientation structurally consistent with Ayurveda's Loka-PurushaSamyaSiddhanta (the principle of correspondence between the individual body and the external

Table 1. Classical Ritucharya recommendations and corresponding modern climate-health correlates

Ritu (Season)	Classical Dosha Dynamic	Key Classical Recommendation	Modern Climate-Health Correlate
Shishira (Late Winter)	KaphaSanchaya (accumulation)	Warm, unctuous food; protection from cold	Cold-wave preparedness; respiratory infection prevention
Vasanta (Spring)	KaphaPrakopa (aggravation)	Light, dry, Kapha-reducing diet; Vamana in eligible individuals	Seasonal allergy/respiratory flare mitigation
Grishma (Summer)	VataSanchaya; Adana Kala (peak depletion)	Cooling, hydrating, easily digestible food; avoid peak-heat exertion	Heat-action guidance; heat-stroke and dehydration prevention
Varsha (Monsoon)	VataPrakopa; Pitta Sanchaya	Boiled/purified water; light diet; avoid stagnant-water exposure	Vector-borne and water-borne disease prevention
Sharad (Autumn)	Pitta Prakopa	Cooling, sweet foods; Virechana in eligible individuals	Post-monsoon cardiorespiratory and pollutant-load risk mitigation
Hemanta (Early Winter)	KaphaSanchaya begins; Visarga Kala (peak strength)	Calorie-dense, unctuous, strength-building diet	Cold-season immune and metabolic resilience

Figure 1.Ritucharya as a climate-adaptation model

Stage	Ritucharya Principle	Adaptive Mechanism	Climate-Health Parallel
1	Ritusandhi (gradual seasonal transition)	→Progressive behavioural/dietary adjustment	Anticipatory adaptation vs. abrupt exposure shock
2	Ritu-specific Ahara/Vihara	→ Season-matched thermoregulatory & digestive support	Heat-action planning; nutrition security in extremes
3.	Recognition of RituVaishamya (Atiyoga/Ayoga/Mithya Yoga)	→ Heightened vigilance during anomalous seasons	Climate-variability early-warning and preparedness
4	Seasonal Panchakarma (Vamana/Virechana) in eligible individuals	→ Periodic physiological "reset"	Seasonal preventive health screening

Figure 1 depicts the proposed four-stage adaptive logic of Ritucharya as a template for anticipatory, season-matched climate-health adaptation. Arrows denote proposed, not proven, causal direction.

7. DETAILED DISCUSSION

7.1 Similarities between classical and modern frameworks

Both frameworks share an anticipatory, rather than purely reactive, orientation: Ritucharya prescribes preparation in advance of season change (via Ritusandhi), just as contemporary heat-action plans and seasonal-preparedness campaigns are structured around pre-season warning and behavioural adjustment. Both also recognise that atypical seasonal expression (RituVaishamya / climate variability) constitutes a distinct, heightened-risk category warranting specific vigilance, rather than being treated as a variant of ordinary seasonal risk.[12,13]

7.2 Differences and interpretive caution

Ritucharya was formulated for the specific climatic and agrarian context of the Indian subcontinent under historically stable seasonal patterns; its six-season, solstice-based structure does not map uniformly onto other climatic zones, and its underlying Dosha-based causal model differs fundamentally from the vector-biology, aerosol-physics, and thermophysiological mechanisms now used to explain climate-health impacts. Direct empirical trials evaluating Ritucharya-based interventions against climate-sensitive health outcomes (heat-illness incidence, vector-borne disease incidence) are essentially absent from the literature identified in this review; the correlations presented here are conceptual and hypothesis-generating rather than causally established.

7.3 Practical applications

The clearest near-term practical application lies in behavioural messaging: Ritucharya'sGrishma-Ritu guidance (hydration, avoidance of peak-heat exertion, cooling diet) is directly compatible with, and could reinforce uptake of, existing WHO/national heat-action-day recommendations in South Asian populations for whom the Ayurvedic framework carries cultural familiarity and trust.[6,14]

7.4 Limitations

- Absence of direct interventional trials linking Ritucharya practices to climate-sensitive health outcomes.
- Six-Ritu classical model reflects North Indian seasonal patterns and requires regional adaptation for other climatic zones.
- Risk of overstating equivalence between Dosha-based and modern mechanistic explanations if not carefully qualified.

7.5 Future scope

Prospective, region-adapted evaluation of Ritucharya-informed seasonal health messaging embedded within existing heat-action and vector-borne-disease-control programmes represents a feasible and currently unexplored research avenue.

8. RECENT RESEARCH EVIDENCE

Study	Year	Design	Sample/Scope	Major Finding	Clinical Significance
WHO. Heat and health fact sheet	2026 (updated)	Technical report	Global	489,000 annual heat-related deaths (2000-2019); 85% rise in over-65 heat mortality (2000-04 to 2017-21)	Quantifies urgency for Grishma-Ritu-style heat adaptation
UN. Taking action for the health of people and the planet	2024	UN technical synthesis	Global	250,000 additional annual deaths projected 2030-2050 from climate-sensitive causes; USD 1.09 trillion labour-capacity loss (2024) from heat	Establishes scale of climate-health burden requiring adaptive frameworks
Mao Q, Zhu X, Zhang X, Kong Y. Effect of air pollution on global CVD burden (GBD 2021). Front Med. 2024. DOI:10.3389/fmed.2024.1472996	2024	GBD-based systematic analysis	Global, 1990-2021 with projection to 2050	.46 million CVD deaths and 58.3 million DALYs in 2021 attributable to air pollution	2 Supports seasonal pollutant-load mitigation relevance of Sharad-Ritu guidance

Study	Year	Design	Sample/Scope	Major Finding	Clinical Significance
World Heart Federation. World Heart Report 2024	2024	Global report	Global, LMIC focus	Rising air-pollution-attributable cardiovascular burden, particularly in LMICs	Highlights South Asian relevance of seasonal cardiorespiratory risk mitigation
Impacts of breaching planetary boundaries on human health. GeoHealth/PMC12125609	2025	Narrative review	Global	Rising temperatures increase heat stress, respiratory disease, and vector-borne illness spread (e.g., malaria)	Supports Varsha/Grishma-Ritu vector- and heat-risk anticipation
heath Guard Measures of Ayurveda Against Climatic Variation - A Review. AYUSHDHARA	2024	Ayurvedic narrative review	Classical + applied literature	Ritucharya provides systematic seasonal dietary/lifestyle adaptation across six Ritus	Direct classical-modern bridge for this review's framework

9. PUBLIC HEALTH PERSPECTIVE

Climate-health adaptation is now an explicit priority within global health governance: the WHO Heat-Health Action framework, the UN's climate-and-health advocacy, and the World Economic Forum's Climate & Health initiative all call for scalable, low-cost, community-level adaptation strategies alongside health-system strengthening.[1,6,14] India's National Health Policy and the AYUSH Ministry's mandate to integrate traditional preventive knowledge into public health provide an existing institutional pathway through which Ritucharya-informed seasonal health messaging could be piloted, particularly for heat-preparedness and monsoon water-safety campaigns, without displacing conventional emergency and clinical response capacity.[6] Such integration would also be consistent with SDG 3 (health and well-being) and SDG 13 (climate action) co-benefit framing increasingly used in planetary-health policy discourse.[13]

10. FUTURE RESEARCH DIRECTIONS

- Prospective evaluation of Ritucharya-informed heat-adaptation messaging against conventional heat-action-day communication, using heat-illness incidence as outcome.
- Region-specific adaptation and validation of the six-Ritu classical model for non-North-Indian climatic zones.
- Investigation of seasonal Panchakarma (Vamana/ Virechana) timing relative to objective seasonal immune and cardiorespiratory risk markers.
- Integration studies examining Ritucharya-based messaging within existing vector-borne-disease-control and air-quality-alert programmes.
- Development of a validated framework mapping RituVaishamya (Atiyoga/Ayoga/Mithya Yoga) onto quantitative climate-variability indices.

11. PRACTICAL RECOMMENDATIONS

For Clinicians

- Incorporate season-specific hydration, dietary, and activity-timing counselling aligned with current Ritu into preventive consultations, particularly ahead of Grishma and Varsha.

For Researchers

- Design prospective studies directly testing Ritucharya-based seasonal interventions against climate-sensitive health outcomes rather than relying solely on conceptual correlation.

For Public Health Professionals

- Use Ritucharya'sRitusandhi concept to frame pre-season (rather than only in-season) public messaging for heat-waves and monsoon-related risk.

For Yoga Practitioners

- Adjust Vyayama intensity and timing seasonally, reducing exertion and shifting practice timing during Grishma consistent with classical Adana Kala guidance.

For Policymakers

- Explore pilot integration of Ritucharya-informed

seasonal messaging within AYUSH-linked components of national heat-action and vector-control programmes.

For Students

- Use the six-Ritu framework (Section 4.1) as a structured bridge between classical Swasthavritta theory and contemporary climate-health and planetary-health concepts for examination and research preparation.

12. CONCLUSION

Ritucharya represents a historically sustained, conceptually anticipatory model of human seasonal adaptation whose core structural principles — gradual seasonal transition, season-matched behavioural and dietary modification, and explicit vigilance during seasonal anomaly — align meaningfully with the priorities of contemporary climate-health adaptation, planetary health, and One Health frameworks. While direct empirical evidence linking specific Ritucharya interventions to climate-sensitive health outcomes remains limited, the framework's low cost, cultural resonance, and conceptual alignment with current heat-action and seasonal-preparedness priorities justify its structured exploration as a complementary component of climate-health adaptation strategy, pending further interventional research.

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