

Udaka To Precision Hydration: An Ayurvedic Policy Framework for Personalized Water Management in Twenty-First Century Healthcare

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Abstract

Background- Ayurveda, through the concept of Udaka, presents an individualized framework for water regulation that has not yet been systematically examined within the context of precision medicine or healthcare policy. The Ayurvedic concept of Udaka provides a multidimensional framework for individualized hydration that complements modern physiology and may inform future precision healthcare and evidence-informed hydration policy. Despite remarkable advances in hydration science, current recommendations remain predominantly population-based and often fail to account for substantial inter-individual variability arising from age, physiology, climate, disease, occupation, and lifestyle.

Objectives - To critically review the concept of Udaka and evaluate its relevance to contemporary hydration science, precision medicine, and healthcare policy. Evaluate current hydration recommendations and their limitations. Explore the role of individualized hydration in precision healthcare.

Methods: A comprehensive narrative review was conducted with the use of biomedical databases, international policy documents, and classical Ayurvedic texts. Scientific literature on precision medicine, health-climate interactions, and preventive healthcare was critically reviewed together with primary Ayurvedic literature.

Results: In particular, the review revealed considerable conceptual convergence between the current scientific concepts regarding hydration and the concept of Udaka in Ayurveda. The current scientific literature confirms the understanding of hydration as a dynamic process that involves various mechanisms of neuroendocrine regulation, renal control, metabolism, environment and behaviour. At the same time, Ayurveda views Udaka as a systemic parameter that affects physiological homeostasis and is associated with the processes of nourishment, hydration, circulation, temperature control and excretion. Both frameworks accept the idea of differentiating hydration needs depending on an individual and external conditions. Nonetheless, existing public health policies mostly concentrate on issues of universal water access, water quality and sanitation, without paying much attention to the problem of assessment of individual hydration needs. On the basis of the findings, the Udaka-Based Precision Hydration Conceptual Framework was elaborated.

Conclusion: The concept of Udaka reveals an innovative interdisciplinary angle to rethink the issue of hydration in the light of personalized approach rather than generic recommendations concerning fluid intake. The potential of integration of Ayurveda with modern hydration science can help to develop the precision hydration strategies that would contribute to the development of preventive medicine, increase climate resilience, and be used in future policy making on the issue.

1. INTRODUCTION

Global Burden of Hydration and Health related challenges

Water is indispensable for life and constitutes the largest component of the human body, accounting for approximately 50-70% of total body mass depending on age, sex, and body composition. It serves as the principal medium for biochemical reactions, maintains cellular architecture, facilitates nutrient transport, regulates body temperature, preserves hemodynamic stability, and supports renal, gastrointestinal, neurological, and endocrine functions. Because water participates in virtually every physiological process, maintaining fluid homeostasis is fundamental to human survival and health. Even mild dehydration has been associated with impaired cognitive performance, reduced physical endurance, altered mood, diminished thermoregulatory capacity, and increased cardiovascular strain, while chronic inadequate hydration has been linked to kidney stone formation, chronic kidney disease progression, urinary tract disorders, constipation, and metabolic dysfunction.¹

Hydration has consequently emerged as a major global public health concern. The United Nations Sustainable Development Goals (SDGs) recognize universal access to safe water (SDG 6)² as a prerequisite for achieving good health and well-being (SDG 3)³, highlighting the inseparable relationship between water security and human health (United Nations, 2015)⁴. Similarly, the World Health Organization (WHO) identifies access to safe drinking water as one of the most cost-effective public health interventions, capable of reducing communicable diseases, improving maternal and child health, and strengthening community resilience.⁵ Despite remarkable progress in water accessibility over recent decades, billions of individuals continue to experience inadequate access to safely managed drinking-water services, exposing vulnerable populations to dehydration, water-borne diseases, malnutrition, and heat-related illnesses⁶. These challenges are expected to intensify with accelerating climate change, rapid urbanization, demographic transitions, and increasing occupational heat exposure, making hydration a critical component of future healthcare planning.

Current Understanding of Hydration Science

Advances in renal physiology, neuroendocrinology, and molecular biology have elucidated sophisticated mechanisms governing water homeostasis, including hypothalamic osmoreceptors, thirst perception, arginine vasopressin secretion, aquaporin-mediated water transport, renal concentrating mechanisms, and the renin-angiotensin-aldosterone system.⁷ These discoveries have transformed the understanding of body water regulation from a passive process of fluid replacement into a tightly coordinated physiological network that continuously maintains osmotic equilibrium despite substantial environmental and metabolic fluctuations. Beyond ensuring water availability, modern healthcare increasingly recognizes that adequate hydration is not synonymous with uniform hydration recommendations. Physiological water requirements exhibit considerable interindividual variability influenced by age, sex, body composition, metabolic activity, physical exercise, dietary intake, environmental temperature, humidity, altitude, pregnancy, lactation, chronic disease, and pharmacological interventions.⁸ Nevertheless, most international hydration guidelines continue to provide generalized population-based recommendations intended for apparently healthy individuals.

Limitations of Existing Hydration Recommendations

Although these recommendations remain valuable for nutritional planning and public health surveillance, they cannot fully accommodate the biological diversity observed across individuals

and populations. Consequently, there is increasing recognition that future hydration strategies should move beyond universal intake recommendations toward more individualized and context-specific approaches. This transition parallels the broader evolution of medicine from generalized healthcare toward precision medicine, an emerging paradigm that seeks to tailor prevention, diagnosis, and treatment according to individual biological, environmental, and lifestyle characteristics⁹. These limitations suggest that hydration science remains an evolving discipline requiring broader conceptual frameworks capable of integrating physiological complexity with individual variability.

Precision Medicine and Personalized Healthcare

Precision medicine has already transformed oncology, pharmacogenomics, cardiovascular medicine, and metabolic disease management by recognizing that individuals respond differently to identical interventions¹⁰. Similar developments are occurring in nutrition science through the concept of precision nutrition, which integrates genetics, metabolism, microbiome composition, behavioural factors, and environmental exposures to generate personalized dietary recommendation¹¹. In contrast, hydration science has progressed comparatively slowly in adopting individualized frameworks, despite compelling evidence that hydration status is influenced by dynamic interactions among physiological regulation, environmental conditions, occupational demands, and behavioural practices. Consequently, the emerging concept of precision hydration has attracted growing attention as a potential strategy for optimizing health outcomes through individualized water management rather than population averages. The scientific foundation of hydration physiology has expanded substantially over the past century. Nevertheless, important knowledge gaps remain regarding the optimal assessment of hydration status, clinically meaningful hydration biomarkers, individualized water prescriptions, and long-term health outcomes associated with different hydration behaviours.¹²

Traditional Indian Medicine Perspective

Traditional systems of medicine may provide complementary conceptual perspectives for addressing these challenges. Among them, Ayurveda represents one of the oldest continuously practiced systems of medicine and is fundamentally based on individualized healthcare. Rather than considering health solely as the absence of disease, Ayurveda conceptualizes health as a dynamic equilibrium maintained through the harmonious interaction of Dosha, Dhātu, Mala, Agni, Srotas, and environmental influences. Individual constitution (Prakriti), digestive capacity (Agni), age (Vaya), geographical location (Desha), seasonal variation (Kala), strength (Bala), dietary habits, and behavioural practices collectively determine physiological balance and therapeutic decision-making.¹³ This individualized framework closely aligns with the conceptual objectives of contemporary precision medicine, although it is expressed through a distinct epistemological and theoretical foundation. Within this holistic paradigm, the concept of Udaka occupies a central yet insufficiently explored position. Conventionally translated as "water," Udaka encompasses considerably broader physiological implications than the mere consumption of drinking water.¹⁴ Classical Ayurvedic texts describe Udaka as an essential determinant of nourishment, tissue integrity, circulation, thermoregulation, excretion, metabolic equilibrium, and maintenance of life.¹⁵ Moreover, Udaka demonstrates intimate relationships with Rasa, Lasika, Kleda, Sweda, and Mutra, collectively contributing to the preservation of internal fluid homeostasis. Importantly, Ayurvedic literature consistently emphasizes that the requirement, utilization, and physiological effects of Udaka are influenced by constitution, digestive strength, environmental conditions, season, physical activity, disease state, and dietary practices, implying an inherently individualized

approach to hydration. Such observations remarkably parallel current discussions surrounding precision hydration, despite having originated within an entirely different medical tradition.¹⁷ Despite its conceptual richness, the contemporary scientific literature has largely confined Udaka to discussions of water intake, methods of drinking, seasonal regimens, or descriptive comparisons with body water physiology. Few investigations have critically examined Udaka as a systems-level construct capable of informing personalized hydration strategies, preventive medicine, or healthcare policy. Likewise, modern hydration science rarely incorporates insights from traditional knowledge systems when addressing individualized water requirements, despite acknowledging persistent uncertainties regarding optimal hydration assessment and personalized fluid recommendations. This disconnect represents a missed opportunity for interdisciplinary dialogue between ancient medical philosophy and contemporary biomedical science. The convergence of global health priorities—including climate resilience, healthy ageing, occupational health, chronic disease prevention, and sustainable healthcare systems—creates a timely opportunity to revisit the concept of Udaka from an integrative scientific perspective. Rather than interpreting Udaka as a direct equivalent of total body water or any single physiological compartment, it may be more appropriately understood as a multidimensional construct encompassing fluid regulation, constitutional variability, environmental adaptation, and physiological homeostasis. Such an interpretation does not seek to replace established biomedical principles but instead provides a conceptual framework capable of generating new hypotheses for hydration research and informing individualized healthcare strategies.

Rationale of the Review

Bridging Ayurvedic concepts with modern hydration science may therefore contribute to the ongoing evolution of precision medicine by expanding the theoretical foundations through which hydration is understood and managed. Accordingly, the present review critically synthesizes classical Ayurvedic literature on Udaka with contemporary evidence from hydration physiology, precision medicine, public health, and healthcare policy.

Aim of the Presented Review

The review aims to examine the relevance of Udaka as a conceptual framework for individualized hydration, evaluate areas of convergence and divergence between traditional and biomedical perspectives, identify existing research gaps, and propose future directions for integrating personalized hydration into preventive healthcare and evidence-informed policy. By positioning Udaka within the broader context of twenty-first-century health systems, this review seeks to stimulate interdisciplinary research that advances hydration science beyond generalized recommendations toward a more individualized, systems-oriented, and preventive paradigm.

2. MATERIAL AND METHODOLOGY

Study Design: - This review is intended to be a critical narrative review with policy synthesis and seeks to combine classical literature on Ayurveda with evidence from the biomedical sciences, public health, and healthcare policy domain. Unlike a systematic review, which is based on a narrow clinical question, this review employs an interdisciplinary perspective to synthesize evidence in multiple areas including Ayurvedic concepts, physiology of hydration, precision medicine, preventive care, adaptation to climate change, and health policy.

Review Framework: - The methodology of this review is based on the Scale for the Assessment of Narrative Review

Articles (SANRA) and follows the principles of transparent evidence identification recommended by the PRISMA 2020 Statement wherever possible for narrative evidence synthesis. The process of conducting a review included five consecutive steps:

1. Identification of research question
2. Literary review and data retrieval
3. Screening and selection of relevant evidences
4. Thematic synthesis
5. Development of integrative conceptual framework

The review was guided with the following research question: Can the Ayurvedic concept of Udaka provide a scientifically relevant framework for individualized hydration, precision medicine, and evidence-informed healthcare policy?

Data Sources: - A thorough literature search was carried out in order to find the required evidence from biomedical sources, healthcare

policies, and classical Ayurvedic literature. Biomedical evidence was obtained from PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library. International healthcare policies were found from WHO, United Nations, UNICEF, FAO, EFSA, NASEM, CDC, and IPCC. Classical Ayurvedic evidence was extracted from the critical editions of Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, Ashtanga Sangraha, Kashyapa Samhita, and Nighantus.

Search strategy: - Literature search used the combination of controlled terms (MeSH terms) and free-text terms related to science of hydration, physiology of body water, precision medicine, healthcare policy, climate health, and Ayurveda. Search terms used in the search strategy included such words as "hydration," "fluid homeostasis," "water balance," "precision hydration," "precision medicine," "public health," "healthcare policy," "Ayurveda," "Udaka," "Rasa," "Lasika," "Kleda," "thirst," and "water intake." Boolean logic (AND, OR, NOT), phrase searching, and term truncation were used to maximize the sensitivity and specificity of the search.

Eligibility Criteria: - Sources were selected according to pre-defined criteria. Eligible sources included peer-reviewed original research articles, systematic reviews and meta-analyses, international policy documents, clinical guidelines, consensus statements, landmark studies in physiology, and classical Ayurvedic sources written in English language or translated into it. Conference papers, editorials without scientific evidence, duplicate publications, non-peer reviewed web resources, commercial sites, and those that lacked the methodological quality or relevance to hydration, Udaka, or healthcare policy were excluded.

Evidence Selection: - Selected sources were screened first by title, then by abstract and finally by full text in order to assess their relevance to objectives of the study. Priority was given to international regulatory sources, high impact factor peer-reviewed journals, landmark studies in physiology, recent evidence syntheses, and primary Ayurvedic literature. Among those, the most comprehensive and methodologically strong sources were chosen for the synthesis.

Data extraction: - The pertinent data were collected following a consistent process for the sake of uniformity across the

reviewed studies. The variables collected from the literature included bibliographic data, objective of the study, methodology of the study, study population (if any), main findings, policy implications, implications for understanding of hydration physiology, relation to Ayurvedic theory, and potential contributions to the nascent field of precision hydration.

Evidence synthesis: - Since the purpose of the present review was to construct a conceptual and policy-based framework, a qualitative thematic synthesis of evidence was performed as against a quantitative meta-analysis. The collected evidence was divided into major thematic clusters such as global issues concerning hydration, physiology of body water, classical Ayurvedic concepts of Udaka, biomedical comparison, precision hydration, health care policy, climate change resilience, preventive medicine, and areas of future research.

Conceptual Framework Development: - An original conceptual framework was formulated through an iterative process of synthesizing evidence from classical Ayurvedic literature, hydration science, precision medicine, and public health policy. Instead of formulating a framework that equates the concepts from Ayurvedic and biomedical sciences, conceptual intersections were identified which can potentially serve as the basis for hypotheses for future research, clinical application, and public health policies.

Limitations of Methodology: - Being a narrative review study, this work does not present pooled quantitative measures of effect, making this work vulnerable to interpretative bias associated with qualitative evidence synthesis. Despite an exhaustive search strategy, publication bias and language barriers could influence the evidence base. In addition, some concepts discussed in this paper from the Ayurvedic perspective are still conceptually distinct from modern biomedicine and thus must be considered as conceptual analogies rather than physiological counterparts.

4. RESULTS

Overview of Retrieved Literature

A thorough review of biomedical literature, international policy documents, and classical texts of Ayurveda has revealed a multi-dimensional view of the concept of hydration, which goes beyond the traditional view of water intake. As shown in the synthesized data, the idea of hydration is increasingly becoming perceived as a multidimensional phenomenon. It includes not only physiological aspects but also the environmental, behavioural, and public health perspectives. Meanwhile, classical Ayurvedic literature consistently views Udaka as an essential factor for maintaining homeostasis, whose role involves more than just fluid intake. It concerns such processes as nutrition, metabolism, thermoregulation, excretion, and maintenance of tissue integrity. The major findings of the review are presented according to six thematic domains.

Global Perspectives on Hydration and Public Health

It has been consistently found that the reviewed international policy documents viewed hydration as one of the important determinants of global health. International reports published by the World Health Organization (WHO), United Nations (UN), UNICEF, and other organizations state that access to safe water is crucial for achieving the Sustainable Development Goals 3 (Good Health and Well-being) and 6 (Clean Water and Sanitation).¹⁷ However, despite some achievements, dehydration, insufficient fluid intake, heat stress, and water insecurity still constitute an important health problem among children, elderly people, manual

workers, athletes, and people living in climatically adverse regions. Climate change, increasing urbanization, and heat exposure at work contribute to the need in hydration strategies based on scientific evidence.

Contemporary Knowledge on the Physiology of Hydration

It has been found that the physiological mechanisms underlying water balance are quite sophisticated and include the activity of hypothalamic osmoreceptors, thirst regulation, release of arginine vasopressin, renal water retention, electrolytes balance, and neuro-endocrine mechanisms.¹⁸ Water balance was consistently seen as a dynamic process, influenced by numerous intrinsic and extrinsic factors, instead of a set amount of daily water intake. Factors such as age, sex, body composition, physical activity, ambient temperature, diet, health status, and medications were identified as the major factors affecting individual needs in fluids. However, existing guidelines are mostly population-based¹⁹

Evidence Supporting Individualized Hydration

One of the critical pieces of evidence derived from the review of literature was the increased emphasis on personalized hydration. Research in precision medicine, sports physiology, and clinical nutrition has shown considerable variation in the interindividual differences in terms of water requirements, hydration biomarkers, sweating rate, electrolyte losses, ability to concentrate urine, and response to dehydration.²⁰ Development of wearable devices, digital biomarkers, and artificial intelligence has encouraged the exploration of individualized hydration approaches. There is no clinically accepted model that integrates constitutional, physiological, environmental, and behavioural factors in developing hydration recommendations for each individual, pointing out the critical lack in modern healthcare²¹

Classical Ayurvedic Concept of Udaka

Analysis of the classical texts of Ayurveda has revealed, Udaka is a vital factor that plays the role of ensuring the state of physiological balance. Contrary to being merely drinking water, Udaka is strongly associated with Rasa, Lasika, Kleda, Sweda, Mutra, digestion, nutrition, blood circulation, thermoregulation, and excretory system.²² Besides, variations in the water requirement depending on Prakriti, Agni, Bala, Vaya, Kala, Desha, Ahara, and Vyayama are described in the classical literature, indicating the personalized approach to hydration.²³

Gaps in Current Hydration Policy

Review of the existing policy frameworks has shown that currently established hydration policies are mainly concerned with access to water, quality of drinking water, sanitation, nutrition, and prevention of dehydration in case of emergencies or exposure to heat.²⁴ There is relatively small attention paid to assessment of individual hydration, clinical screening of hydration status, hydration literacy, and personalized recommendation on water intake among various physiological and occupational groups. None of the reviewed documents referred to classical ideas of Udaka as the framework for individualized hydration and preventive healthcare.

In summary, the current synthesized evidence suggests that the notion of hydration as a multidimensional determinant of health including physiological, environmental, behavioural, and public health aspects. The classical Ayurvedic literature offers a systematic and individualized approach to the notion of Udaka which corresponds to current trends in precision medicine and personalized healthcare. On the other hand, current biomedical research offers solid evidence of body water regulation but is lacking a conceptual framework for integration of individual and environmental variability into consideration.

4. DISCUSSION

Principle Findings

One of the major contributions of this review is the theoretical overlap between the principle of individualized hydration within

Ayurveda and the concept of precision medicine. Contemporary medical care is increasingly moving from the one-size-fits-all approaches²⁵ based on the average needs of the population towards personalized strategies accounting for differences between individuals in terms of their genetic make-up, physiology, environment, lifestyle, and susceptibility to certain diseases in order to improve the preventive and treatment outcomes. More recently, the World Health Assembly endorsed precision medicine as a strategic priority for establishing equitable, patient-centred, and data-driven health systems that incorporate molecular, clinical, environmental, and digital health data into healthcare practice.²⁶ While generalized guidelines on hydration can be considered a hallmark of contemporary medicine, Ayurveda has long been advocating for an individualized approach to water intake via the framework of Udaka, which takes into consideration such factors as Prakriti (constitutional phenotype), Agni (digestive/metabolic abilities), Desha (geography), Kala (season), Vaya (age), Bala (strength), diet and physical activity.²⁷ This constitutional approach is similar to that in precision medicine in its essence despite the difference in paradigms used. Rather than comparing Ayurvedic principles to current physiologic ones, this review contends that the Udaka framework should be seen as a system-based model that may aid in the formulation of hypotheses for precision medicine research on hydration.²⁸

There are several implications of the findings of the current literature review for public health and healthcare policies. As stated earlier, today's international framework of policies for public health emphasizes universal access to safe drinking water, sanitation, hygiene, and the prevention of water-borne diseases.²⁹ Safe water is viewed as a human right and one of the major determinants of population health. Although these policies have greatly contributed to positive health outcomes by decreasing the number of infectious diseases and ensuring equitable access to water resources, the existing policies have a predominantly population-based orientation and do not provide sufficient guidance related to personalized hydration assessment or precision hydration. It signifies that optimal hydration recommendations specific to individuals should augment rather than supersede universal public health advice.³¹ Such an approach may be useful for risk stratification, improving hydration literacy, strengthening preventative care strategies, and developing person-centred hydration guidelines for high-risk populations like children, outdoor workers, athletes, older persons, and patients with chronic diseases. This is also relevant to the general transition from reactive to predictive, preventive, personalized, and participatory (P4) medicine.³²

Climate change has become one of the most dangerous global factors threatening human hydration and health, as higher ambient temperature, extended heatwaves, changes in precipitation, and an increase in the number of extreme weather events raise the risk of dehydration, heat-related problems, renal injury, and cardiovascular diseases.³³ Vulnerable groups of people, such as elderly and children, pregnant women, outdoor workers, athletes, military people, and populations having no access to potable

water, experience the negative impact more intensely. Therefore, hydration becomes an important part of climate change adaptation and health resilience rather than the problem related to nutrition only. The current climate adaptation and health policy, which is mostly focused on the creation of heat action plans, occupational safety, and access to clean water, does not address the extensive range of needs that each person has in terms of hydration when under environmental stress.³⁴

In India, there have been developed several flagships by the Government that tackle water availability, quality, conservation, and preventive healthcare. First, the Jal Jeevan Mission (Har Ghar Jal) launched in 2019 under the Ministry of Jal Shakti seeks to provide every rural household with a tap water connection for providing safe and adequate drinking water and promoting source sustainability, rainwater harvesting, greywater management, community participation, and water quality monitoring, thus addressing SDG 6. As a complement to the previous initiative, the³⁵ Jal Shakti Abhiyan - Catch the Rain campaign seeks to promote water conservation and climate resilient water resource management through decentralized community participation.³⁶ Within the field of healthcare, the National Health Mission (NHM) seeks to include safe drinking water, sanitation, nutrition, and health promotion in primary healthcare delivery through integration with Swachh Bharat Mission, Poshan Abhiyaan, and WASH in schools³⁷, thus acknowledging the importance of safe water access as a determinant of health for mothers, children, and communities.³⁸ All of the above-mentioned initiatives demonstrate India's shift from water supply to integrated water management and preventive public health approach. However, current policies predominantly focus on universal coverage, water quality, and conservation without addressing the issue of individualization of hydration status or implementation of precision hydration approaches accounting for the physiological and environmental factors or constitutionality of people. Inclusion of the concept of Udaka Based Precision Hydration Framework in these policy frameworks may contribute to advancement in these directions.

Conclusions drawn from evidence generated through modern hydration science, precision medicine, public health, and traditional Ayurveda lead us to propose a concept of a Udaka-Based Precision Hydration Framework as a conceptual framework for future research. It is important to note that the framework is designed to complement rather than to contradict the current hydration guidelines based on scientific evidence. In order to prove the feasibility of this model, one will have to conduct observational studies, biomarker research and prospective clinical trials. Nevertheless, it can be seen as a road map to advance precision hydration as a new discipline that is based on the combination of Ayurveda, systems biology, preventive medicine and public health. With this framework in place, it will become possible to carry out future research on personalized hydration and health policies in the context of evidence-informed and climate-resilient health systems.

Proposed Udaka -Based Hydration Framework

A) Domain 1 - Hydration Determinants

The below mentioned determines Individual Hydration Requirement

Table 1. Determinants of Individual Hydration

Biomedical Determinants	Ayurvedic Determinants
Age	Prakriti
Sex	Agni
Body composition	Koshtha
Renal function	Dhatu
Endocrine regulation	Bala
Genetics	Vyayama
Physical activity	Desha
Diet	Kala
Comorbidities	Ahara
	Vihara
	Satmya

B) Domain 2 - Precision Hydration assessment

Along with above mentioned determinants, further inputs from modern sciences can be included for the assessment such as Bioimpedance, sweat rate, biomarkers, osmolality and other.

C) Domain 3 - Precision Hydration Intervention

It includes prescription of water volume, timing, temperature, electrolytes, seasonal adjustments, disease specific advices and lifestyle modification based on Hydration determinants and assessment of individual.

D) Outcomes

It is anticipated that the Udaka-Based Precision Hydration Framework will produce multi-dimensional results spanning clinical, public health, and policy fields. At an individual level, personalized hydration could result in improvements in fluid balance, body temperature regulation, metabolic efficiency, kidney functions, cognitive functioning, and physiological resilience through matching individual hydration approaches based on biological and environmental individual features. In terms of preventive health care, personalized hydration assessment might help identify those populations that are at risk of dehydration and heat-related conditions as well as develop life-style approaches to health promotion. From the perspective of populations at large, precision hydration integration into healthcare systems would enhance the capacity to become resilient to climate changes, promote health in the workplace, healthy aging, maternal and children's health as well as prevent chronic conditions. Moreover, the framework allows for developing a scientific basis for creating evidence-based hydration guidelines and future healthcare policies that link individual risk assessment with public health approaches.

7. CONCLUSION

Effluent While new trends in precision medicine encourage healthcare interventions that consider individual biological variability, modern scientific evidence demonstrates that the regulation of water balance in the human body occurs through interactions of various neuroendocrine, renal, metabolic,

environmental, and behavioural mechanisms. However, the current recommendations and public health regulations continue to mostly depend on general recommendations that do not take into consideration enough constitutional, environmental, and behavioural variables that influence a person's hydration demands. In terms of Ayurvedic knowledge, Udaka is a physiologically complete structure that includes nutrition, tissue hydration, thermoregulation, circulation, metabolism, and excretion in addition to drinking water. The conventional notion of Udaka encompasses the impact of Agni, Desha, Kala, Vaya, Bala, and Prakriti on hydration, thus providing the idea of personalization inherent to contemporary precision health. This paper doesn't aim to equate Ayurvedic and biomedical approaches, but rather to pinpoint intersections that might spark interdisciplinary research and help develop hypotheses for personalized hydration evaluations. The Udaka-Based Precision Hydration Framework, which incorporates constitutional evaluation with modern hydration physiology, environmental variables, biomarkers, and digital health, may be suggested as a theoretical paradigm based on the evidence presented. Although more translational research, biomarker studies, and clinical trials are needed to confirm this framework, it appears to be a good starting point for the development of precision hydration as a new field. The integration of Udaka's systems-oriented view with biomedical science is expected to promote the creation of climate-resilient health systems, tailored preventive healthcare, and new healthcare policies concerning hydration.

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