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# Integration of Rasayana Dynamics and Chakshushya Therapeutics in Modern Preventive Ophthalmology—A Narrative Review article

**[1]Mandera Sachi Anilkumar and [2]Jasna Chandran**

[1,2]Department of Shalakya Tantra, Parul Institute of Ayurveda and Research, Ishwarpura, Vadodara - 391760 (India)

**Corresponding Author :** Dr. Mandera Sachi Anilkumar

E mail id: mandera.sachi99@gmail.com

Contact no: 9773154714

## Abstract

The global burden of ocular illnesses such as Computer Vision Syndrome (CVS), dry eye disease, and age-related retinal degeneration has been significantly compounded by the increasing incidence of digital screen exposure, environmental stressors, and an aging population. Although modern ophthalmology has made considerable progress in the area of diagnostic and therapeutic procedures, the methods for the prevention of long-term ocular health disorders are still limited. Ayurveda has a complete preventive strategy with Rasayana Tantra and Chakshushya Dravyas, which are traditionally used to maintain visual function, retard ocular aging, and stimulate tissue renewal. This narrative study attempts to understand the possible role of Rasayana therapy in preventative ophthalmology with a special reference to ancient Ayurvedic principles and current biomedical findings. The review discusses antioxidant, anti-inflammatory, neuroprotective, immunomodulatory, and mitochondrial-protective effects of several Rasayana and Chakshushya herbs, which can be beneficial for retinal protection and preservation of visual function. The emerging concepts, such as the gut–retina axis and lipid-mediated phytochemical transport, are also examined to provide putative molecular explanations for the preventative activities of Ayurvedic therapies. Rasayana therapy in combination with evidence-based preventive ophthalmology is an interesting, comprehensive approach to improve ocular resilience, retard degenerative processes, and preserve visual health. Further experimental

[1]PG Scholar, [2]Associate Professor

studies and well-designed clinical trials are needed to confirm these notions and allow their inclusion in current ophthalmic practice. Rasayana, Chakshushya, preventive ophthalmology, ocular aging, retinal neuroprotection, oxidative stress, and Ayurveda.

**Key words :** Ocular illness, Rasayana dynamics, Chakshushya Neuroprotection, oxidative stress.

Vision is one of the most important of the sensory functions and is a key factor in learning, communication, productivity, and quality of life. The global pattern of ocular disorders has dramatically changed over the last two decades due to rapid development of technology, greater use of digital devices, environmental pollution, urbanization, and higher life expectancy. The extensive use of digital screens has led to a significant increase in computer vision syndrome (CVS) and digital eye strain, characterized by ocular dryness, burning sensation, blurred vision, ocular fatigue, headache, and decreased visual efficiency.[8,13] At the same time, age-related ocular disorders, including age-related macular degeneration (AMD), glaucoma, diabetic retinopathy, cataract, and retinal neurodegeneration, remain the major causes of irreversible visual impairment globally.[2,16] These changing epidemiological trends emphasize the increasing need for preventive strategies that preserve ocular function before irreversible structural damage sets in Modern ophthalmology has seen tremendous advances in diagnosis and management of eye illnesses using advanced imaging modalities, microsurgical methods, laser therapies, targeted pharmaceutical interventions, and regenerative medicine. But most of these approaches are still focused on treating diseases that have already undergone pathological changes, with relatively little attention paid to protecting retinal health, improving physiological resilience, and preventing ocular degeneration.[5] Therefore, preventive ophthalmology has become an important area of research for maintaining visual function, slowing down age-related degeneration and improving the lifelong health of the eyes. Ayurveda is the traditional Indian system of medicine. It provides a holistic model of health care with its emphasis on prevention of diseases and promotion of health by maintaining physiological balance. Among its 8 specialized branches, Rasayana Tantra is one that only deals with rejuvenation, healthy aging, tissue regeneration, immunity enhancement, and prolongation of life span. Rasayana therapy is described in Charaka Samhita as a method for enhancing Agni (metabolic efficiency), Dhatu Poshana (tissue nourishment), Srotas Shuddhi (maintenance of microcirculatory channels), and Ojas (vital essence), which in turn increases the body's adaptive capacity and delays the process of aging[11]. Aging (Jara) is a natural but progressive phenomenon characterized by Dhatu Kshaya, Agni Mandya, and predominance of Vata Dosha, resulting in functional decline of various organs, including the eyes.[11] In Ayurveda the eye (Netra) is seen as one of the most precious sensory organs, and the preservation of it is given substantial emphasis in classical literature. The Sushruta Samhita, the principal work on Ayurvedic ophthalmology, describes several Chakshushya Dravyas,

which nourish ocular tissues, enhance visual acuity, maintain the physiological function of Alochaka Pitta, and prevent progressive visual deterioration.[12] Classical formulations like Triphala Ghrita, Mahatriphala Ghrita, and various Rasayana preparations are traditionally recommended for ocular nutrition, delaying degenerative changes, and supporting long-term visual health.[12] Recent advances in molecular ophthalmology have revealed oxidative stress, mitochondrial dysfunction, chronic inflammation, impaired autophagy, apoptosis, and cellular senescence as the key mechanisms involved in retinal aging and several degenerative eye diseasest[4,5]. The retina is one of the tissues with the highest metabolic rates in the human body and is constantly exposed to visible light and oxygen, rendering retinal pigment epithelial (RPE) cells and photoreceptors highly vulnerable to reactive oxygen species (ROS)-mediated damage. Long-term oxidative stress alters the balance in mitochondria, increases inflammatory reactions, and causes gradual retinal degeneration.[4] Interestingly, these molecular pathways disclose striking conceptual similarities with Ayurvedic knowledge of impaired Agni, increasing Dhatu Kshaya, altered Dosha equilibrium, and loss of Ojas. These analogies offer a logical rationale for investigating historical Ayurvedic therapies in the context of contemporary preventive ophthalmology. Some Rasayana and Chakshushya herbs such as Amalaki (Emblica officinalis Gaertn.), Guduchi (Tinospora cordifolia (Willd.) Hook. f. Ashwagandha (*Withania somnifera* (L.) Dunal), Triphala, Yashtimadhu (*Glycyrrhiza glabra* Linn.), and Shatavari (*Asparagus racemosus* Willd.) include several phytochemicals such as polyphenols, flavonoids, tannins, emblicanins, withanolides, alkaloids, and glycyrrhizin (Thomson). In experimental studies, the bioactive constituents have exhibited strong antioxidant, anti-inflammatory, immunomodulatory, neuroprotective, and mitochondrial protective effects, which contribute to the reduction of oxidative damage, preservation of retinal pigment epithelial cells, inhibition of cell apoptosis, and promotion of neuronal survival.[3,4,6,10,14,15]

Emerging biomedical evidence also suggests that several phytochemicals derived from Rasayana herbs regulate redox-sensitive signaling pathways, including Nuclear Factor Erythroid 2–Related Factor 2 (Nrf2) and Sirtuin-1 (SIRT1), which are essential for maintaining antioxidant defense, mitochondrial integrity, and cellular longevity.[1] Recent research describing the gut–retina axis further indicates that intestinal microbiota influence systemic inflammation, immune regulation, and retinal homeostasis, supporting the Ayurvedic concept that preservation of Agni is fundamental to maintaining systemic and ocular health.[9] Moreover, lipid-based Ayurvedic formulations such as Ghrita may enhance the bioavailability, absorption, and tissue penetration of phytochemicals, improving their therapeutic efficacy and enabling targeted ocular delivery.[7] These collective observations suggest that Rasayana and Chakshushya therapeutics provide a holistic, multitargeted strategy for preventive ophthalmology by concurrently targeting oxidative stress, inflammation, mitochondrial dysfunction, immune dysregulation, and age-related decline in cells. The integrative approach is focused on preserving retinal integrity, enhancing intrinsic ocular resilience, and

promoting visual longevity rather than just on disease management. The present narrative review, therefore, intends to critically synthesize traditional Ayurvedic principles and contemporary biomedical facts to provide a scientifically appropriate framework for preventive ophthalmology and to identify future directions for translational research in ocular health.

*Study Design :*

The present study was developed as a narrative and integrative review to critically examine the significance of Rasayana and Chakshushya therapies in preventative ophthalmology. The review carefully combines historical Ayurvedic principles with contemporary biomedical information to develop a scientific basis for ocular health enhancement, retinal protection, and visual longevity.

*Objective :*

To correlate the traditional Ayurvedic principles with the contemporary advancements in ocular biology and retinal neuroprotection to examine the function of Rasayana Dynamics and Chakshushya therapies in preventative ophthalmology.

- To examine the Ayurvedic ideas of Rasayana and Chakshushya Dravyas in the preservation of eye health.[11,12]
- To make a compilation of the pharmacological qualities of key Rasayana and Chakshushya medicinal plants with possible applications in ophthalmology.[6,10,14,15]
- Correlate Ayurvedic concepts like Agni, Dhatu Poshana, Alochaka Pitta, Ojas, and Rasayana with modern mechanisms like oxidative stress, inflammation, mitochondrial dysfunction, retinal neuroprotection, and healthy aging.[1,4,5,11,12]
- To formulate an evidence-based conceptual approach for integration of Ayurveda with modern preventive ophthalmology.

*Sources of data :*

Classical Ayurvedic literature and modern biomedical literature were comprehensively reviewed. Classical references were taken from authentic Ayurvedic works, including Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, with special reference to Rasayana Chikitsa, Chakshushya Dravyas, Netra Roga, and preventive healthcare principles.[11,12]

Modern scientific evidence was obtained from peer-reviewed journals indexed in PubMed, Scopus, Google Scholar, Web of Science, and Science Direct. Inclusion criteria were publications on oxidative stress, retinal aging, retinal neuroprotection, mitochondrial biology, phytochemicals, nutraceuticals, ocular medication delivery, and preventive ophthalmology.[1,3,10,13,16]

The present review reveals a lot of conceptual congruence between old Ayurvedic ideas and current biological understanding of preventative ophthalmology. Analysis of classical literature reveals that the purpose of Rasayana therapy is to maintain the integrity of tissues, enhance metabolic efficiency (Agni), improve Dhatu Poshana, preserve Ojas, and delay the physiological processes of aging, while Chakshushya Dravyas are specifically described to maintain visual acuity and preserve ocular function.[11,12] Critical

analysis of contemporary biomedical literature showed that certain of the Rasayana and Chakshushya medicinal herbs have multitarget pharmacological properties such as antioxidant, anti-inflammatory, neuroprotective, immunomodulatory, anti-apoptotic, and mitochondrial-protective actions. These biological activities collectively work to reduce oxidative stress, inhibit chronic inflam mation, maintain mitochondrial homeostasis, protect retinal pigment epithelial (RPE) cells, preserve retinal ganglion cells, and mitigate progressive retinal degeneration.[1,3,4,6,10,14,15] Amalaki showed substantial antioxidant activity among the studied medicinal plants, mainly due to its high vitamin C and polyphenolic compound content, and Guduchi showed significant immunomodulatory and anti-inflammatory effects.

*Ashwagandha* showed promise for neuroprotective potential via regulating oxidative stress and mitochondrial activity, and Triphala exhibited broad-spectrum antioxidant and cytoprotective activities important for ocular surface maintenance and retinal preservation.[6,10,14,15] The evidence reviewed also suggests that a number of phytochemicals isolated from Rasayana herbs modulate key intracellular signaling pathways, particularly Nrf2 and SIRT1, thereby enhancing endogenous antioxidant defense, reducing oxidative injury and promoting cell survival.[1] These molecular mechanisms offer a plausible scientific basis for the rejuvenative effects documented in classical Ayurvedic literature. Recent evidence for the gut–retina axis suggests that intestinal microbiota influence systemic inflammation, immune homeostasis, and retinal physiology, thus supporting the Ayurvedic tenet that maintaining Agni is essential to preserving systemic and ocular health.[9] Moreover, lipid-based formulations such as Goghrita may improve the absorption, bioavailability, and tissue penetration of phytochemicals, enabling effective delivery to ocular tissues and enhancing therapeutic efficacy.[7] Overall, the synthesized evidence indicates that integration of Rasayana Dynamics and Chakshushya therapeutics provides a comprehensive, multitargeted preventive strategy capable of simultaneously addressing oxidative stress, mitochondrial dysfunction, chronic inflammation, immune dysregulation, and cellular aging. The findings suggest the potential relevance of Ayurveda as a complementary method in preventive ophthalmology and provide a scientific basis for future translational and clinical research to promote ocular longevity and preserve visual function.

The present review emphasizes the need to use Rasayana Dynamics and Chakshushya therapies in modern preventative ophthalmology by combining traditional notions of Ayurveda with recent evidence in ocular biology. While the diagnosis and management of ocular disorders have been significantly improved through the use of advanced imaging techniques, microsurgical interventions, pharmacotherapy, and regenerative approaches, the preventive strategies that delay the onset and progression of ocular degeneration are limited.[2,5] The increasing global prevalence of digital eye strain, dry eye disease, diabetic retinopathy, glaucoma, and age-related macular degeneration highlights the need for the development of safe, holistic, and evidence-based preventive interventions.

According to Ayurveda, the first aim of Ayurveda is to maintain health (Swasthasya

Swasthya Rakshanam). In this context Rasayana Tantra is intended for improving the quality of tissue nourishment, enhancing the metabolic efficiency, slowing down the aging process, strengthening the immune system, and increasing longevity through the optimization of the quality of Agni, Dhatu Poshana, Srotas, and Ojas.[11] The concept of Chakshushya Dravyas is particularly relevant to the preservation of visual function by nourishing the ocular tissues and maintaining the physiological activity of Alochaka Pitta and thereby preventing progressive deterioration of vision.[12] These classical principles show a remarkable conceptual similarity with modern preventive medicine, which focuses on the maintenance of cellular homeostasis and prevention of chronic degenerative diseases. Oxidative stress is one of the most critical mechanisms involved in retinal aging. The retina is one of the most metabolically active tissues in the human body and is exposed to high oxygen tension and visible light, which may cause an overproduction of reactive oxygen species (ROS). Chronic oxidative stress causes mitochondrial dysfunction, lipid peroxidation, chronic inflammation, apoptosis of retinal cells, and progressive neurodegeneration.[4] Thus, antioxidants with the ability to scavenge ROS have received much attention as possible preventive therapies for retinal disorders. This present study analyzed the experimental data that some classical Rasayana plants show significant antioxidant action. Amalaki is known for its ability to scavenge free radicals and protect retinal pigment epithelial cells from oxidative damage due to its high vitamin C and polyphenolic content.[10] Guduchi has antioxidant, anti-inflammatory, and immunomodulatory properties that can reduce inflammation-induced damage and improve mitochondrial function.[15] Ashwagandha has been shown to have neuroprotective effects by modulating oxidative stress, inhibiting apoptosis, and preserving retinal ganglion cells, while Triphala has broad-spectrum antioxidant and cytoprotective activities that support ocular surface health and retinal integrity.[6,14] Molecular biology's recent advancements have provided more scientific background to Rasayana therapy. The phytochemicals in these medicinal plants have been shown to modulate intracellular signaling pathways such as nuclear factor erythroid 2–related factor 2 (Nrf2) and sirtuin-1 (SIRT1), which are critical for antioxidant defense, mitochondrial biogenesis, cell survival, and healthy aging.[1] Activation of these pathways increases endogenous antioxidant enzyme systems, reduces oxidative injury, and enhances cellular resilience. The results provide a credible molecular basis for the rejuvenating benefits reported in the old Ayurvedic literature. Another important thing that came out of this review is the developing concept of the gut–retina axis. There is mounting data indicating that modifications in the gut microbiota impact systemic inflammation, immunological responses, and retinal homeostasis.[9] This approach is very much in line with the Ayurvedic principle that maintaining Agni is fundamental to overall health. Rasayana therapy may indirectly contribute to ocular health via modulation of systemic inflammatory and immunological pathways by enhancing digestive efficiency and metabolic balance. The traditional Ayurvedic dosages also possess pharmacological advantages. Ghrita is often termed "yogavahi" and has lipid-soluble properties that may enhance intestinal absorption, bioavailability of phytoconstituents,

and tissue penetration and may overcome barriers in ocular drug delivery.[7] These lipid-mediated delivery systems are becoming popular in modern pharmaceutics, and it also supports the relevance of classical Ayurvedic formulations in modern therapeutics. Unlike traditional medication that generally targets a single molecular route, Rasayana formulations act on a multicomponent and multitarget basis, simultaneously affecting oxidative stress, inflammation, mitochondrial malfunction, immunological modulation, apoptosis, and cellular aging. This systems-based therapy approach aligns well with the increasing interest in integrative medicine and precision preventative healthcare. There is interesting experimental data, but robust clinical validation is lacking. The available research is preclinical, with relatively few properly planned RCTs assessing long-term ocular outcomes. Therefore, further interdisciplinary research on standardized herbal formulations, pharmacokinetic studies, molecular studies, multicentric randomized controlled trials, and translational research merging Ayurveda and modern ophthalmology is warranted. Such evidence will assist the creation of scientifically proven preventive methods for ocular health preservation and visual longevity.

This review indicates that the premise of Rasayana Dynamics and Chakshushya therapy is very similar to the modern concepts of preventative ophthalmology. Classical Ayurvedic literature emphasizes the importance of preservation of ocular health through improvement of Agni, Dhatu Poshana, Ojas, and maintenance of Alochaka Pitta. On the other hand, modern biomedical research identifies reduction of oxidative stress, preservation of mitochondria, immune modulation, and retinal neuroprotection as crucial factors for healthy ocular aging. Several Rasayana and Chakshushya medicinal plants have been experimentally shown to possess strong antioxidant, anti-inflammatory, neuroprotective, immunomodulatory, and cytoprotective activities that may help preserve retinal function and prevent age-related eye disorders. These conventional beliefs, together with the discoveries in molecular biology, give a scientifically valid basis for preventive ophthalmology and encourage the creation of holistic methods for visual health.Although the data available are promising, further well-designed experimental studies, pharmacological investigations, and multicenter randomized clinical trials are required to establish standardized therapeutic protocols and to prove the clinical efficacy of the Rasayana-based preventive interventions. A combination of Ayurvedic knowledge with modern ophthalmic research might help to a large extent in future strategies for promoting ocular longevity, alleviating the load of degenerative eye disease, and improving quality of life.

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