The Role of Nutrition and Integrative Ayurvedic Principles in Age-Related Macular Degeneration (ARMD): A Literature Review.

Abstract

Age-Related Macular Degeneration (ARMD) is a major cause of irreversible central vision loss in the elderly population. It primarily involves the macula, the part of the retina responsible for sharp and fine visual detail. In contemporary medicine, ARMD is classified into two forms: dry (atrophic) and wet (neovascular). Key contributing factors include oxidative stress, persistent inflammation, drusen build-up, and degeneration of the retinal pigment epithelium. In wet ARMD, the formation of abnormal new blood vessels leads to significant impairment of vision.

In *Ayurveda*, ARMD can be correlated with *DrishtigataRoga*, particularly Timira, which is linked with aggravated *Vata Dosha*, tissue depletion (*Dhatu Kshaya*), and under-nutrition (*Apatarpana*). Wet ARMD also presents features resembling *Rakta-Pitta Dushti* due to bleeding tendencies and leakage from blood vessels.

This review outlines the pathophysiological mechanisms of both dry and wet forms of ARMD and emphasizes the role of dietary antioxidants in slowing disease progression. It also discusses the supportive benefits of Ayurvedic interventions such as *Rasayana* therapy and *Chakshushya* measures for eye health.

Key Words–Age-Related Macular Degeneration, ApatarpanjanyaVyadhi, Timir, Chakshushya, Rasayan.

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1. Introduction & Historical Context

Modern Perspective

ARMD involves the macula, which is the central part of the retina responsible for precise and detailed vision. With rising life expectancy, the global incidence of ARMD has also increased.

Ayurvedic Perspective: *ApatarpanjanyaVyadhi*

In Ayurvedic understanding, the eye is considered the seat of *Alochaka Pitta*. In the aging phase *(Vardhakya)*, an increase in *Vata Dosha* makes ocular tissues more susceptible to degenerative

changes. ARMD can be correlated with *DrishtigataRoga*, particularly Timira, which is associated with progressive degeneration of visual structures.

ARMD as an ApatarpanjanyaVyadhi

- ***Dhatu Kshaya* (Tissue Degeneration):**Degeneration of the retinal pigment epithelium (RPE), Bruch's membrane, and choriocapillaris can be compared with the depletion of *Majja, Rasa*, and *Rakta Dhatu.*
- ***Srotorodha* (Microchannel Obstruction):**The buildup of metabolic waste products like lipofuscin and drusen obstructs retinal microcirculation, resulting in reduced blood flow, ischemia, and progressive retinal degeneration.

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2. Clinical Classification: Dry vs Wet ARMD

I. Dry (Atrophic) ARMD

• Represents about 85–90% of ARMD cases.
• Characterized by drusen deposition and gradual degeneration of RPE.
• Leads to slowly progressive blurring of central vision.
• In Ayurvedic view, it is mainly a *Vata Pradhana* condition associated with *Shosha* and *Dhatu Kshaya*.

II. Wet (Neovascular) ARMD

• Accounts for nearly 10–15% of cases but causes severe visual loss.
• Characterized by formation of abnormal, fragile blood vessels beneath the retina.
• Leads to retinal edema, hemorrhage, and scar formation.
• In Ayurvedic understanding, it is correlated with *Rakta-Pitta Pradhana* pathology due to *Rakta Dushti*, *Raktasrava*, and *Srotodushti*.

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3. Pathophysiology of ARMD[1]

Dry ARMD

1. **Oxidative Stress:**
   The retina has a high oxygen demand and is continuously exposed to light, which leads to the generation of reactive oxygen species (ROS) that can injure retinal cells.
2. **Lipofuscin & Drusen Formation:**
   Incomplete degradation of photoreceptor by-products results in accumulation of lipofuscin and formation of drusen deposits.

3. **Chronic Inflammation:**
   Drusen activates complement cascades, leading to ongoing retinal inflammation and progressive damage to photoreceptors.

Wet ARMD

1. **Retinal Hypoxia:**
   Thick drusen deposits impair oxygen delivery to retinal tissues, leading to reduced oxygenation.
2. **VEGF Overexpression (Vascular Endothelial Growth Factor):**
   Decreased oxygen levels stimulate increased production of VEGF.
3. **Neovascularization:**
   Fragile abnormal blood vessels develop beneath the retina and may leak fluid or blood into the macula.

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4. Nutrition and Retinal Diseases [2]

Nutrient	**Specific Retinal Disease / Manifestation**	**Clinical Presentation & Signs**
Vitamin A (Retinol)[3]	Vitamin A Deficiency Retinopathy (VADR)	Nyctalopia (night blindness), subretinal hyperreflective granular deposits, and rod-cone dysfunction.
Vitamin B12 (Cobalamin)	Nutritional Optic Neuropathy & Retinal Hemorrhages	Centrocetal scotomas, blurred vision, bilateral central retinal vein occlusion (CRVO), and flame-shaped hemorrhages.
Vitamin C (Ascorbic Acid)	Retinal Hemorrhages & Macular Degeneration Progression	Microaneurysms, intraretinal bleeding, and accelerated progression of advanced age-related macular degeneration (AMD).
Vitamin E (Tocopherol)	Photoreceptor Degeneration & AMD Progression	Lipofuscin accumulation in the retinal pigment epithelium (RPE), macular thinning, and loss of central photoreceptors.

Zinc (Zn)	RPE/Choroid Complex Atrophy & Delayed Dark Adaptation	Drusen formation, poor dark adaptation, accelerated geographic atrophy in AMD, and apoptotic photoreceptor death.

Role of Nutrition in ARMD

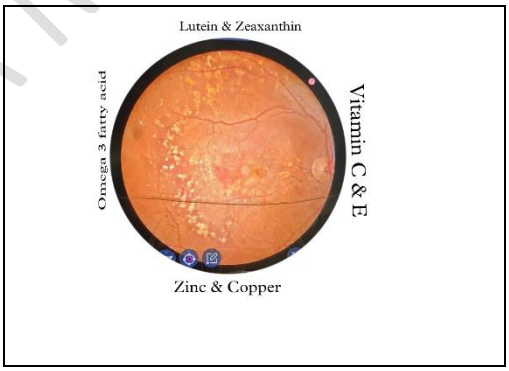
AREDS & AREDS2 Studies (Age Related Eye Disease Study)[4]

The AREDS and AREDS2 studies showed that antioxidant supplements can help slow the progression of intermediate ARMD.

- **AREDS Formulation:** Included Vitamin C, Vitamin E, Beta-carotene, Zinc, and Copper.
- **AREDS2 Modification:** Beta-carotene was replaced with Lutein and Zeaxanthin because Beta-carotene increased lung cancer risk in smokers. Omega-3 fatty acids were also added.

Important Nutritional Components

Lutein & Zeaxanthin



- Concentrated in the macula.
- Filter harmful blue light.
- Reduce oxidative damage.
- Improve macular pigment density.

Omega-3 Fatty Acids (DHA/EPA)

- Maintain integrity of photoreceptor cell membranes.
- Provide anti-inflammatory effects.

Zinc & Copper

- Zinc supports antioxidant enzymes such as superoxide dismutase.
- Copper prevents zinc-related anemia.

Vitamins C & E

- Protect retinal tissues from oxidative damage.
- Help maintain antioxidant activity.

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4. Ayurvedic Perspective & Integrative Management

ARMD Type	Dominant Dosha	Ayurvedic Approach
Dry ARMD	Vata	Vataghna, Rasayana, Brimhana
Wet ARMD	Rakta-Pitta	Raktapittaghna, Stambhana

I. Dry ARMD: Vataghna&Rasayana Therapy

Goal: To reduce degeneration, nourish retinal tissue, and support vision.

II. Wet ARMD: Raktapittaghna&Stambhana Therapy

Goal: To reduce hemorrhage, edema, and vascular leakage.

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6. ApatarpanVyadhi Chikitsa Sutra[5]

तेषां सन्तर्पणं तज्ज्ञैः पुनराख्यातमौषधम्|
यत्तदात्वे समर्थं स्यादभ्यासे वा तदिष्यते ||चरक सूत्र २३/३०.

Santarpana is the definitive Chikitsa for Apatarpana-janyavyadhis .

- Santarpana is of two types.
  The first is that which gives an immediate (Sadyah) effect and is capable of alleviating Apatarpana-janyaVyadhi (diseases caused by undernourishment/depletion).
- The second is that which produces its nourishing effect through Abhyasa (regular and continued use).
  Therefore, Santarpana Chikitsa may act either as an immediate Brimhana (nourishing) therapy or as a long-term nourishing regimen.

7. Rasayana Therapy in ARMD

Several Ayurvedic herbs and natural compounds have been studied for their potential role in ARMD management due to their antioxidant and anti-angiogenic properties. Preparations such as Triphala, Tulsi, Spirulina, Punarnava, and Shatavari are considered beneficial as they provide antioxidant effects along with nutrients like vitamins C, E, and zinc[6,7].

Similarly, substances including Shatavari, Amalaki, Draksha, Elaichi, Pippali, and Dadima (Punica granatum), along with animal-derived products such as Ghrita, meat, and fish, are traditionally

used in formulations like Anjana (collyrium), Putapaka, and Tarpana. These are regarded as Chakshushya and are believed to support ocular health by supplying lutein and zeaxanthin.[8]

8. ChakshushyaDravyas[9]

Ayurvedic literature, particularly Raja Nighantu, describes various *ChakshushyaDravyas*—substances believed to promote eye health and visual function.

Table 1. ChakshushyaAahara Dravya (Vision-supportive Dietary Substances)

Aahara Dravya	Ayurvedic Properties
Vanshekshu	Madhura Rasa
Shitakhanda (Mishri)	Madhura Rasa, Sheeta Virya
Madhu	Sheeta Virya, Vata-Pitta Shamaka
Hastini Kshira	Madhura-Kashaya Rasa, Sheeta Virya
Manushi Kshira	Madhura-Kashaya Rasa, Sheeta Virya
StriDadhi	Madhura Vipaka

Table 2. ChakshushyaAushadhi Dravya (Vision-promoting Medicinal Substances)

Sr	Aushadhi Dravya	Ayurvedic Properties	Sr	Aushadhi Dravya	Ayurvedic Properties
1	Mudgaparni	Sheeta Virya	**10**	Krishna Jeeraka	Katu Rasa, Ushna Virya
2	Swarnajivanti	Madhura Rasa, Sheeta Virya	**11**	Yashtimadhu	Tikta Anurasa, Sheeta Virya
3	Ashwakshura (Aparajita)	Tikta Rasa, Sheeta Virya, Tridosha Shamaka	**12**	Ajashrungi	Tikta-Katu Rasa
4	Indivara	Katu Rasa, Sheeta Virya, Kapha-Pitta Shamaka	**13**	Karanja	Katu Rasa, Ushna Virya
5	Shweta Kantakari	Katu Rasa, Ushna Virya, Kapha-Vata Shamaka	**14**	Putrajiva	Sheeta Virya, Pitta Shamaka
6	Shruta Shreni	Katu Pradhana	**15**	Kshudra Champaka	Katu Rasa, Ushna Virya, Kapha-Vata Shamaka
7	Bhringaraja	Tikta Rasa, Ushna Virya, Kapha Shamaka	**16**	Raja Taruni	Kashaya Rasa
8	Kulatthika	Tikta-Katu Rasa	**17**	Kataka	Tikta-Katu Rasa, Ushna Virya
9	Shweta Jeeraka	Katu-Madhura Rasa	**18**	Bibhitaka	Katu-Tikta-Kashaya Rasa, Kapha Shamaka

9. Discussion

ARMD is a common ocular disorder in the elderly that gradually leads to loss of central vision. The main contributing factors include oxidative stress, inflammation, and retinal degeneration. Modern research such as AREDS and AREDS2 has shown that nutrients like lutein, zeaxanthin, vitamins C and E, zinc, and omega-3 fatty acids may help slow disease progression and support retinal protection.

In Ayurveda, ARMD can be correlated with *Timira* and other *Drishtigata Rogas*, primarily caused by aggravated *Vata Dosha* and progressive tissue degeneration. Dry ARMD is mainly associated with *Vata imbalance*, whereas wet ARMD is linked with *Rakta-Pitta Dushti* due to bleeding and fluid leakage. Ayurvedic herbs such as *Amalaki*, *Ashwagandha*, *Yashtimadhu*, *Punarnava*, and *Triphala* are considered beneficial owing to their antioxidant, anti-inflammatory, and *Rasayana* properties. Therapies like *Tarpana*, *Nasya*, and *Rasayana* are also used as supportive measures for ocular nourishment and vision care.

An integrative approach combining proper nutrition, healthy lifestyle, and Ayurvedic management may help slow disease progression and support overall eye health.

10. Conclusion

ARMD is a progressive eye disorder mainly linked with aging, oxidative stress, and retinal degeneration. Nutritional supplements rich in antioxidants and macular pigments play a key role in maintaining and protecting visual function. In Ayurveda, ARMD is viewed as a condition associated with *Vata imbalance* and tissue depletion, where *Rasayana* and *Chakshushya* therapies are advised for ocular support.

An integrative approach that combines modern nutritional supplementation with Ayurvedic principles may provide a holistic method for managing ARMD and enhancing quality of life. However, further clinical research is needed to validate the effectiveness of Ayurvedic interventions in ARMD management.

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