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A REVIEW ARTICLE ON AYURVEDA CORRELATE WITH DIABETIC RETINOPATHY

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ABSTRACT

The recognition of *Prameha* as one of the eight major disorders in the *Charak Samhita* underscores the significance that *Ancient Ayurvedic* scholars attributed to this condition, acknowledging it as a major health concern. *Prameha* is viewed as an early stage of *Madhumeha* (diabetes mellitus) if it is not properly managed. According to the *Charak Samhita*, *Prameha* results from an imbalance of the three *Doshas (Vata, Pitta, Kapha),* leading to an excess of sweet taste (*Madhur Rasa)* in the body. One of the serious complications of *Prameha* is diabetic retinopathy, which can lead to blindness in individuals with diabetes. Individuals with *Prameha* are at an elevated risk of developing diabetic retinopathy. The high sugar levels can damage the blood vessels in the retina, contributing to progressive vision loss. In the context of diabetes-related blindness (*Madhumehajanaya Timir*), all three *Doshas* and seven *Dhatus* are impacted, including the four layers of the eye (four *DrishtiPatal).* This review examines the integration of *Ayurvedic* knowledge with modern scientific understanding, focusing on the relationship between *Ayurveda* and Diabetic Retinopathy*(Dwitiya Patalgata Timir).*

KEYWORDS: *Ayurveda*, Diabetes mellitus, diabetic retinopathy, *Avarana, Timir.*

INTRODUCTION

2. AYURVEDA

Ayurveda, often referred to as the "Science of Life," traces its origins to ancient India. Rooted in the Vedic scriptures, *Ayurveda's* historical journey encompasses centuries of refinement, with contributions from eminent scholars such *as Charaka* and *Sushruta.* Its evolution mirrors

the assimilation of knowledge from diverse sources, including indigenous traditions and philosophical frameworks.

2.1.1 Detailed Exploration of *Doshas (Vata, Pitta, Kapha)*

Vata: *Vata*, associated with the elements of air and ether, governs movement and communication. A balanced *Vata* promotes creativity and vitality, while an excess may manifest as anxiety, dryness, or restlessness.

Pitta: *Pitta*, emanating from fire and water elements, governs metabolism and transformation. In equilibrium, Pitta fosters intellect and digestion, but imbalances can lead to irritability, inflammation, or hyperacidity.

Kapha: *Kapha*, grounded in earth and water elements, governs stability and structure. A harmonious *Kapha* imparts strength and nourishment, yet excess may result in lethargy, congestion, or weight gain.

2.1.2 The Significance of *Tridosha* Theory

The cornerstone of *Ayurvedic* philosophy is the *Tridosha* theory, recognizing the dynamic interplay of *Vata*, *Pitta*, and *Kapha* in sustaining health. The human constitution, known as *Prakriti*, represents a unique blend of these *Doshas*, shaping individual characteristics, physical tendencies, and susceptibilities to imbalances.

Prakriti* Determination*: *Prakriti* is determined at the moment of conception and remains constant throughout an individual's life. Understanding one's *Prakriti* provides profound insights into inherent strengths and vulnerabilities, guiding personalized approaches to diet, lifestyle, and therapeutic interventions.

Imbalances and Disease: *Ayurveda* posits that health arises from the equilibrium of *Doshas*, and disease emerges from their imbalances. By discerning the *Doshic* disturbances underlying ailments, *Ayurvedic* practitioners tailor interventions to restore harmony and address the root causes.

Diabetes mellitus

Diabetes mellitus occurs when blood sugar levels are high due to a lack of insulin. Without enough insulin, the body struggles to process carbohydrates, proteins, and fats properly, which also disrupts water and electrolyte balance. Over time, this imbalance can cause lasting

damage to the body's cells, leading to complications that often impact the eyes, kidneys, and nervous system.

3. MODERN UNDERSTANDING OF DIABETIC RETINOPATHY

Diabetic Retinopathy (DR) is characterized by intricate molecular and cellular alterations in the retina, reflecting the systemic impact of diabetes.

Retinal Microvasculature: The hallmark of DR is microvascular dysfunction. Hyperglycemia triggers a cascade of events leading to endothelial cell damage, impaired vasodilation, and increased vascular permeability. These changes compromise the integrity of the blood-retinal barrier, paving the way for pathological alterations.

Inflammatory Mediators: Elevated glucose levels induce the release of pro-inflammatory cytokines and chemokines. The chronic inflammatory milieu contributes to the recruitment of leukocytes and amplifies retinal tissue damage. Intracellular signaling pathways, including those mediated by nuclear factor-kappa B (NF-κB), play a pivotal role in orchestrating inflammatory responses.

Oxidative Stress: Increased oxidative stress, resulting from an imbalance between reactive oxygen species (ROS) production and antioxidant defenses, is a key driver of retinal pathology. Oxidative damage affects various cellular components, including lipids, proteins, and DNA, exacerbating retinal degeneration.

Discussion on Primary and Secondary Risk Factors

Genetic Predisposition: Genetic factors significantly contribute to an individual's susceptibility to DR. Polymorphisms in genes related to angiogenesis, inflammation, and oxidative stress pathways influence disease onset and progression. Unraveling the interplay between genetics and environmental factors remains an active area of research.

Duration of Diabetes: The duration of diabetes is a primary risk factor for DR development. Prolonged exposure to hyperglycemia increases the likelihood of microvascular complications. The cumulative effect of glycemic exposure underscores the importance of early glycemic control to mitigate long-term retinal damage.

Secondary Risk Factors: Hypertension, dyslipidemia, and obesity constitute secondary risk factors. These systemic conditions contribute to vascular alterations, exacerbating retinal

microvascular dysfunction. Comprehensive management of these comorbidities is integral to holistic DR care.

3.1.1 Insights into Microvascular Complications

Microaneurysms and Hemorrhages: Microaneurysms, resulting from weakened retinal capillary walls, serve as early indicators of microvascular compromise. Hemorrhages, a consequence of vessel fragility, contribute to retinal tissue damage and visual impairment.

Neovascularization: Proliferative DR is marked by neovascularization, an aberrant growth of new blood vessels. These vessels are fragile, prone to leakage, and may lead to vitreous hemorrhage or tractional retinal detachment. The induction of angiogenic factors, particularly Vascular Endothelial Growth Factor (VEGF), plays a central role in this process.

Macular Edema: Accumulation of fluid in the macula, known as macular edema, is a common complication. It compromises central vision and is often associated with increased vascular permeability. Prompt detection and management are crucial to prevent irreversible vision loss. *Samprapti* (Pathology) of *Prameha* in *Ayurveda*

All types of *Prameha* are considered to be *Tridoshaja* (involving all three *Doshas: Vata, Pitta,* and *Kapha). Madhumeha*, in particular, is primarily a *Vata*-pradhana *Tridoshaja* disorder. *Acharya Vagbhata* has outlined two distinct pathologies for *Madhumeha.* The first type occurs due to *Vata* prakopa (aggravation of *Vata*) resulting from *Dhatu Kshaya* (tissue depletion), making it incurable. The second type arises from the obstruction (*Avarana*) of *Vata's* pathway by *Kapha* and *Pitta Doshas*, which is described by *Acharya Vagbhata* as *Kricchsadhya* (difficult to cure).

Acharya Charaka, in his treatise, does not explicitly describe such pathology in the sections on *Prameha Nidana* (etiology) and *Prameha Chikitsa* (treatment). However, in the *Sootrasthanam*, he discusses *Avarana Janya Madhumeha Samprapti* (pathogenesis due to obstruction) and classifies it as *Kricchsadhya.* When an individual consumes food (*Aharaj Nidana)* and engages in lifestyle activities *(Viharaj Nidana*) that lead to the development of *Madhumeha,* there is an increase in *Kapha Dosha, Meda Dhatu* (fat tissue), *Mansa Dhatu* (muscle tissue), and *Pitta Dosha*. These collectively referred to as *Dushya,* obstruct the *Vayu (Vata)* pathway, causing its aggravation. This aggravated *Vayu* carries *Oja* (vital essence) to the bladder (*Mootravaha Srotas),* resulting in the manifestation of Madhumeha.

AVARANA

Avarana refrs to a state of obstruction or blockage in the body's channels or pathways. *Acharya Charak* emphasizes that *Avarana* can lead to various disease, including *Madhumeha*(diabetes). According to *Vagabhata* , *Madhumeha* is a severe and advanced stage of *Prameha.* He further classified *Madhumeha* into two types:

Avarana Janya (blockage based): this type of diabetes is caused by blockage or obstruction in the body channels, leading to impaired digestion, absorption and utilization of nutrients.

Dhatukshyajanaya:

This type of diabetes is caused by the depletion or degeneration of bodily tissues, leading to impaired functioning and damage to organ s.

According to *Charak Prameha Anusanginam* means that diabetes is a condition that often occurs alongside other health issues. Diabetes is frequently accompanied by other complications making it a complex and multifacted disease.

When both *Avarana* and *Dhatukshyajanaya* occurs, all the ten *Dushyas* in the body become imbalnced and depleted. This leads to various symptoms and health issues emerging in different parts of the body, depending on which specific *Dushaya* is affected.

In case of diabetic retinopathy, the main affected tissue is blood vessels(*Rakat Dhatu*). Although all the body tissue are affected, the blood vessels is most impacted.

The channels(*Srotas)* affected are those that carry blood(*Rakatvaha*), muscles(*Mamsavaha*), and fat(*Medovaha*).

This damage can lead to vision problems and other complication.

Pranavritta Vayana: Pranavayu acts like a controller, regulating the functioning of our senses and organs. It is also responsible for *Adankarma* in our body. Our sense organs, like our eyes and ear rely on *Pranavayu* to perceive and interpret the world around us.

Vayan vayu is responsible for gait and movement(*Rasavikshepan*). It plays a crucial role in conducting and coordinating our physical actions like walking running and even our digestion and circulation. Conduction isn't limited to the cardiac cycle; it also includes all types of neural conduction. When *Pranavayu*, the controller, restricts the movement of *Vyana Vayu*, the senses (*Indriyas)* are unable to perceive their respective stimuli. This restriction can affect one sense (homonymous) or all senses (heteronymous) simultaneously. When all senses are

affected, it resembles a vegetative state or deep coma. Blood circulation (*Rasa-Rakta Vikshepana)* is a function of *Vyana Vayu*. In the case of diabetic retinopathy, a vascular disorder can occur due to the obstruction of *Vyana* by *Pranavayu*. This initially leads to retinal ischemia, followed by a series of retinopathic changes such as neovascularization, cotton wool spots, and intra-retinal microvascular abnormalities (IRMA). Early breakdown of the blood-retinal barrier (BRB), formation of hard exudates, and macular edema are other subsequent symptoms.

In *Charaka Samhita's Sutrasthan* describes causes that lead to an increase in *Rakta Dhatu* (blood tissue). This increase hinders the movement of Vata *Dosha*, disrupting normal blood circulation and causing stagnation in the blood channels (*Raktavaha Srotas*). This condition, known as *Raktavritta Vata*, manifests as symptoms like burning sensations in the skin and muscles and swelling with blood discoloration (*Tripathy Brahmananda, 1999, Caraka Samhita, Chikitsa Sthana,* 28:63; P 949). These symptoms can be linked to general neuropathy, with the swelling and discoloration resembling splinter hemorrhages and retinal edema.

The causes of *Raktaja Vyadhi* (blood disorders) mentioned in *Charaka Samhita* share similarities with those of diabetes (*Madhumeha*) and metabolic disorders (*Prameha*). Conditions like *Akshiragam (*eye diseases), *Tamasyatidarshanam* (dim vision), and *Raktapitta* (bleeding disorders) described as *Raktaja Vyadhi* can be associated with vision problems in diabetics due to microvascular complications. In diabetic retinopathy, although there is initially a decrease in blood supply *(Raktakshya*) and ischemia, over time, increased blood flow leads to hemorrhages and exudative changes in the retina.

Dhatukshaya

A. *Sirasaithilya* is a prominent sign of *Raktakshaya* according to *Sushruta.* The initial indicators of Diabetic Retinopathy include the loss of pericytes and the formation of microaneurysms. These can be associated with *Sirasaithilya* resulting from *Raktakshaya*. The first layer *(Patala)* comprises rasa and *Rakta Dhatu,* leading to the manifestation of the disease as microaneurysms, which are relatively mild, resembling early stages of Diabetic Retinopathy or mild Non-Proliferative Diabetic Retinopathy (NPDR). Symptoms of 1st *Patalagata Timir* appear at this stage. Prolonged *Raktakshaya* can lead to hypoxia-induced neovascularization in the diabetic retina.

B. ***Dhamanisaithilya*** is a feature of *Mamsakshaya* and can be linked to the loss of endothelialcells due to improper apoptosis and the loss of capillaries. This results in the early breakdown of the blood-retinal barrier, causing signs like dot/blot or flame-shaped hemorrhages. The second layer (*Patala)* contains *Sookshma Rupi Mamsa Dhatu*, and symptoms of 2nd *Patalagata Timir* are seen in this stage. This stage can be correlated with mild to moderate NPDR, depending on the severity of the affected *Dhatu.*

C. ***Sandhishunyata*** is a characteristic of *Medakshaya* and can be associated with the loss of junctional cell proteins or cell adhesion defects, leading to the breakdown of the blood-retinal barrier. Prominent signs at this stage include macular edema and the formation of exudates. The third layer (*Patala)* consists of *Meda Dhatu*, and when *Dhatu Kshaya* reaches the third *Patala*, symptoms of 3rd *Patalagata Timir* appear. This stage can be correlated with moderate NPDR based on the extent of the affected dhatu. The fourth *Patala* of the *Dristi Patal* is associated with *Asthi* and *Majja Mhatu*, and their loss leads to symptoms of 4th *Patalagata Timir.*

Timiradarshana is a symptom of *Majjakshaya* (Gupta *Atridev*, 2008, *Ashtanga Hridaya, Sootrasthan*, 11:19; P 116) and contributes to *Vata* depletion. This loss of marrow tissue reduces blood cell production, creating a hypoxic environment for retinal neurons. As *Vata* declines, axonal degeneration in retinal nerve fibers can occur, which is linked to hypoxia. This hypoxic axonal degeneration can cause cotton-wool spots or soft exudates in advanced stages of Non-Proliferative Diabetic Retinopathy (NPDR).

Prameha and Diabetic Retinopathy

Among the 20 types of *Prameha,* 19 involve renal and urinary issues, with the exception of *Madhumeha.* A key pathological feature of *Prameha* is Pravuta Avilamutrata, which refers to an increased amount of cloudy urine. This condition can be linked to proteinuria. Over time, *Prameha* often progresses to the *Madhumeha* stage, where signs of nephropathy are commonly seen in chronic diabetes cases. Proteinuria leads to hypoalbuminemia, which reduces serum osmolarity. This, in turn, causes salt and water retention in the extracellular space of the retina. This retention may contribute to diabetic macular edema and general retinal edema.

CONCLUSION

Diabetic retinopathy is a condition affecting the retina, and it is a complication arising from

long-term uncontrolled diabetes due to issues with metabolism and endocrine dysfunction. All three *Doshas (Vata, Pitta, and Kapha)* are involved, with a particular emphasis on *Vata, Pitta, and Kapha Anubandha.* The disease primarily impacts the *Rakta* (blood), *Meda* (fat), and *Mamsa* (muscle) *Dhatus*, and it progresses through the *Raktavaha Srotas* (blood channels) and affects the *Ojavaha Dhamani* (vital energy channels).

If we closely examine the pathology of diabetic retinopathy, it exhibits all four characteristics of *Srotovaigunya* (disorders of the channels) - *Atipravritti* (excess flow), *Sanga* (blockage), *Siragranthi* (nodule formation), and *Vimarga Gamana* (abnormal movement). *Sanga* is observed in the occlusion of retinal vessels, leading to hypoxia and ischemia. *Siragranthi* refers to the formation of microaneurysms, Vimarga gamana is the occurrence of retinal hemorrhages, and *Atipravritti* correlates with neovascularization where new blood vessels form.

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