International Research Journal of Ayurveda & Yoga Vol. 6(11), pp. 61-64, November, 2023
Available online at http://irjay.com
ISSN: 2581-785X
DOI: 10.47223/IRJAY.2023.61113

REVIEW ARTICLE

A Comprehensive Review of Diabetic Retinopathy and Diabetic Macular Edema from an Ayurveda Point of View

Ankur Tripathi[1]*, Shamsa Fiaz[2], Swati Sharma[3]

[1]Assistant Professor, Department of Shalakya Tantra, All India Institute of Ayurveda, New Delhi, India.
[2]Professor & Head, Department of Shalakya Tantra, National Institute of Ayurveda, Jaipur, Rajasthan, India.
[3]Research Officer, CCRAS Headquarters, New Delhi, India.

ARTICLE INFO

Article history:
Received on: 11-10-2023
Accepted on: 14-11-2023
Available online: 30-11-2023

Key words:
Diabetic macular edema,
Diabetic retinopathy,
Drishti,
Prameha,
Retina,
Timira

ABSTRACT

Introduction: Diabetes and other related disorders, such as hypertension, are involved in diabetic retinopathy (DR), a chronic, progressive disease of the retinal microvasculature that threatens vision. The retinal pre-capillary arterioles, capillaries, and venules are impacted by DR. Hyperglycemia damages capillary walls, endothelial cells, retinal cells, and capillary pericytes. It also thickens the capillary basement membrane. The blood-retina barrier is broken down by microangiopathy, which can result in retinal edema, bleeding, lipid leakage (hard exudates), micro-aneurysms, hemorrhages, ischemia, and intraretinal microvascular abnormalities.

Materials and Methods: Ayurveda classical texts along with the internet sources such as Google Scholar and PubMed were reviewed upon to collect the literature available as per the aims of the present article.

Discussion and Conclusion: In Ayurveda, DR can be understood as *Pramehajanya Timira*. Due to prolonged uncontrolled hyperglycemia, two types of pathology in *Madhumeha*: *Dhatukshayajanya* and *Avaranajanya* play a crucial role in the development of DR. *Dhatus* are expelled from the body in *Dhatukshaya*, which leads to several pathogenic events and the development of DME. *Attipravritti*, *Sanga*, *Siragranthi*, and *Vimarga Gamana* are the four varieties of *Srotodusti* that are known to be important in the development of DR and macular edema.

1. INTRODUCTION

Diabetes, which ranks among the top 10 causes of death along with cancer, respiratory disorders, and cardiovascular disease, is one of the biggest worldwide health catastrophes of this century.[1] The World Health Organization reports that non-communicable diseases accounted for 74% of fatalities worldwide in 2019.[2] Diabetes was the tenth biggest cause of death worldwide in 2019 with 1.6 million deaths. It is estimated that 592 million people worldwide will pass away from diabetes by 2035.[3] According to a study, there was a 16.9% prevalence of diabetic retinopathy (DR), a 3.6% prevalence of sight-threatening DR (STDR), and an 11.8% prevalence of moderate retinopathy in people with diabetes. The duration of diabetes (>10 years, OR: 4.8, 95% CI: 3.3–6.9), inadequate or poor glycemic control (≥200 mg/dL, OR: 1.5, 95% CI: 1.2–1.7), and insulin administration (OR: 2.6, 95% CI: 1.7–4.1) were risk factors for DR.[4] Changes in capillary permeability lead to retinal thickness in diabetic macular edema (DME), one of the most common causes of visual loss. When the blood-retina barrier is breached due to damage to the retinal microvasculature, hypoxia occurs. This leads to the generation of vascular endothelial growth factor and edema. Based on epidemiological research, about 7% of people with diabetes may have a higher chance of developing DR and DME. Preventing the onset and advancement of DME requires careful monitoring of blood pressure, cholesterol, and blood glucose levels.[5] In Ayurveda, there is no direct reference to DR rather it would be unjustifiable to correlate it but it is very essential and need of the hour to understand the concept of DR, it's pathogenesis, and course of disease in Ayurveda perspective. The aim of the current study was to determine whether *Pramehajanya Timira*, DR, and DME are related, as well as any potential Ayurvedic causes for the condition.

Corresponding Author:
Ankur Tripathi, Assistant Professor, Department of Shalakya Tantra, All India Institute of Ayurveda, New Delhi, India.
Email: drankuraiia@gmail.com

2. MATERIALS AND METHODS

2.1. Type of Review

Narrative review.

2.2. Materials for Review

Ayurveda classical texts along with internet sources such as Google Scholar and PubMed were reviewed to collect the literature available as per the aims of the present article.

3. RESULTS

Type 2 diabetes, which accounts for 85–95% of all diabetes, has a latent, asymptomatic period of subclinical stages that often go untreated for several years, and as a result, vascular problems are already present in many people when they are diagnosed. Due to the chronic nature of the disease, the signs and symptoms of diabetes take several years to manifest. Understanding the various stages of *Prameha* shows that the asymptomatic and latent phases of diabetes mellitus are *Tridoshaja* state diseases with a *Kapha* predominance.[6] When clinical symptoms of DR appear in a chronic diabetic person, especially if hyperglycemia stays uncontrolled, the *Kapha* predominant stage of *Prameha* eventually shifts to a *Pitta-predominant* stage. Diabetes and its complications are associated with the *Vata*-dominant *Kapha-Pitta Anubandha* stage of *Prameha*, in which all body tissues are depleted.

3.1. *Netra Roga* as a Complication of *Prameha*

Although there are no direct references to ocular complications of *Prameha*, there is enough evidence in all leading Ayurvedic treaties that untreated and advanced *Prameha* leads to weakness of sense organs (*Indriya daurbalya*) and decreased vision, i.e., *Pramehajanya Timira*.[7] The ancient Indian physicians were aware that untreated or improperly treated *Prameha* can cause pathological changes in the eye that impairs vision. DME is the most common cause of visual loss in DR. The sign of DME is a painless gradual loss of vision, which connects with the *Prameha*-caused eye illness *Timira*.

3.2. Probable Pathogenesis of *Pramehajanya Timira*

According to Ayurvedic texts, *Pitta*'s natural seat is the eye, which aids in the execution of its *Prakrita Karma* of *Darshana* and *Doshas* such as *Prana Vayu*, *Vyana Vayu*, *Chakshur Vaisheshika Alochaka Pitta,* and *Tarpaka Kapha* direct physiological activities of the eye.[8,9] *Prameha* is fundamentally a *Tridoshaja Vyadhi* with a *Kapha Dosha* preponderance, and eyes are especially sensitive to vitiated *Kapha Dosha*. The *Drava Guna* of *Kapha* is amplified here due to *Nidana Sevana* such as *Aasya sukham, Swapna sukham,* and *Dadhi*, which are also *Chakshushya*, and these, in turn, vitiate *Mamsa* and *Shareeraja Kleda*, particularly in people with *Sharir-Shaithilya*. As a result, it contributes to the pathophysiology of the disease by increasing the fragility of the eye, resulting in vision loss. As previously established, when type 2 diabetic individuals develop DR, the vitiation of *Doshas* correlates to a state of *Pitta* dominating *Tridosha*. The general etiological elements of Ayurvedic eye diseases are primarily *Chakshushya Ahara-Vihara*, which vitiates *Pitta*.[10] If a diabetic individual continues to consume *Pitta*-vitiating etiological elements, the vitiated *Pitta* vitiates the *Pittavaha Srotas*. The *Raktavaha Srotas* and *Rakta Dhatu* get vitiated due to the comparable character of *Pitta* and *Rakta*, which share *Ashraya Ashrayi Bhava*. The vitiated *Pitta* and *Rakta* have a predisposition to impact the eyes and eventually lead to the appearance of ocular symptoms, depending on the type of *Srotodushti* produced.

3.3. Ayurveda Concept of DR

3.3.1. Predisposing and causative factors

Ayurvedic concept of disease says that a disease is the result of an imbalance in the natural state of *Doshas* which vitiates seven *Dhatus* and *Malas* through four types of *Srotodushti*. Several predisposing and aggravating variables influence the development and severity of retinopathy in diabetic patients, including the patient's *Pitta Prakriti*, inherited factors, *Pitta Kapha* prevalent season, foods, and psychological stress factors such as *Krodha* and *Shoka*. They aid in the vitiation of *Pitta Dosha* and *Rakta Dhatu*. All these factors work together to cause pathological alterations in the blood vessels of the eye, resulting in leakage and hemorrhages in the retina and, ultimately, reduced vision. Depending on the causal circumstances, *Agnimandya*, *Ama* creation, and *Avarana* all play a part in disease progression.[11,12] *Prameha* vitiates all body elements (three *Doshas* and ten *Dushyas*), and all four types of *Srotodusti* arise. *Agnimandya*, *Ama*, and *Avarana* also have a part in the progression of an early stage of *Prameha* into *Madhumeha* as the disease progresses. DR, on the other hand, is a multifaceted disease with a complex pathogenesis.

3.3.2. Srotodushti in DR

Srotas are the pathways in the body that allows for the continuous transport of bodily materials that are being changed into tissues for their future *Dhatus* or tissues. *Srotodushti* is required for disease initiation.[13] All four types of *Srotodushti* (*Atipravritti, Sanga, Siragranthi,* and *Vimarga Gamana*) can be detected in DR at various stages of the disease. Hypoxia-induced neovascularization in DR is associated with *Atipravritti* (excessive formation), retinal vein or artery occlusion and microangiopathy with *Sanga* (obstruction), blood-retinal barrier (BRB) breakdown and hypervascular permeability with *Vimarga Gamana* (deviation from the actual path), and the development of microaneurysms with *Siragranthi Srotodushti*.

3.3.3. Sthana Samshraya in DR

Chronic *Prameha* gradually transforms into *Madhumeha* either because of *Avarana* of *Vata Dosha* by any other *Dosha*, *Dhatu*, or *Mala* or by *Dhatukshaya*. The *Pramehajanya Timira* may be caused by two different kinds of *Avarana*. In DR, *Avarana* may result in vascular damage. Retinal ischemia could be the first symptom, and then, there could be a series of retinopathic alterations, including cotton wool patches, neovascularization, and intraretinal microvascular abnormalities. Hard exudates, macular edema, and an early breakdown of the BRB are additional signs to watch for.

3.3.4. Patala involvement in DR

DR is like *Timira* in that it can affect all four *Patalas*.[14] *Patalas* are described using the functional composition of *Dhatus* engaged in *Drishti* organization. The visual symptoms are caused by vitiated *Dosha* affecting the concerned *Dhatu* in *Drishti Patalas*. All three *Doshas* can affect one or more *Drishti Patala* separately or collectively. A correlation may most likely be established between the various symptoms of *Timira* and the stages of DR. Because the first *Patala* consists of *Rasa* and *Rakta Dhatu*, the disease manifests as microaneurysms and is less severe, which is quite like background DR or mild non-proliferative DR (NPDR), and symptoms of the first *Patalagata Timira* may occur at this stage. The second *Patala* is composed of *Mamsa Dhatu*, and its role in DR has been linked to a loss of pericytes and endothelial cell dysfunction, resulting in an early breakdown of the BRB. Dot and blot or flame-shaped hemorrhages may

develop at this stage and are associated with mild-to-moderate NPDR. The third *Patala* is made up of *Meda Dhatu*, and when *Dhatu Kshaya* reaches the third *Patala*, it produces the third *Patalagata Timira*. It has been linked to junctional cell protein loss, cell adhesion problems, and BRB breakdown. *Asthyasrita* is the fourth *Patala* of *Dristi patala*, and its involvement causes symptoms of the fourth *Patalagata Timira*. Severe macular edema, ischemia, blood vessel proliferation, vitreous hemorrhage, and other symptoms may be present at this stage. Based on the extent of *Dhatu* impacted, this stage may be associated with severe NPDR or PDR.

4. DISCUSSION

DR, one of the main consequences of DM that leads to blindness, is the effect of DM on the retina. By 2030, there will be 191.0 million DR patients worldwide, up from 126.6 million in 2010. In the next two to three decades, about 25% of persons with diabetes and 50% of those with type 2 diabetes may develop macular edema and retinopathy, respectively. It is estimated that 360 million people worldwide will suffer from diabetes and its sequelae. Over 80% of DR cases of blindness are caused by DME, which is the primary cause of blindness in diabetes patients. DME first results in decreased visual acuity, which is uncorrectable with lenses. If treatment is delayed, this might lead to blindness. Therefore, persistently reduced visual functioning interferes with daily activities and eventually lowers quality of life. Working-age individuals are the primary target group for DR and DME. Ayurvedic scriptures do not specifically mention DR or DME, even though these disorders are currently the most prevalent in diabetic patients and cause blindness. Acharya Sushruta and Vagbhata have identified *Prameha* in the *Ashtamahagada*, emphasizing its terrifying nature.[15,16] *Prameha* is a *Kapha Pradhana Tridoshaja Vyadhi* that combines all the *Dhatus* except *Asthi Dhatu*. Acharya Charaka describes *Upadrava* as a persistent secondary illness that causes more troubles for the patient than the initial condition, yet sharing the same etiopathogenesis and causative grounds. Problems instantly disappear when the etiological variables are avoided. *Prameha/Madhumeha* shares the same etiological variables with *Pramehajanya Timira*. *Avarana* and *Dhatu Kshaya Lakshana* make it simple to understand the characteristics of DR and DME. Since *Sarva Indriya Shunyata* happens in the situation of *Pranavritta Vyana,*[17] *Indriya* is unable to recognize their *Vishayas*. *Raktavrita Vata*, which is represented by *Twaka-mamsa Antardasha* and *Rakta Yukta Shotha Mandala*, also has an impact on the development of diabetic vasculopathy in patient's retina. *Rakta Yukta Shotha Mandala* is associated with retinal edema and splinter hemorrhages, while *Twaka-mamsa Antardasha* is associated with diabetic neuropathy. *Shotha*, sometimes referred to as edema and exudates, is another manifestation of *Mamsa Avrita* and *Meda Avrita Vata*. The loss of endothelial cells and capillary pericytes has been linked to *Sira Shaithilya*, which is brought on by *Rakta Dhatu Kshaya*.[12] The development of microaneurysm and retinal hemorrhages is mostly caused by increased permeability, which is brought on by these cellular losses of capillaries. *Mamsa Dhatu* and *Mamsa Kshaya* comprise the second *Patala*, which results in *Dhamani Shaithilya*. In DR and DME, it has been linked to early BRB collapse and endothelial cell loss. Thus, at this stage, the dot and blot hemorrhages signify bleeding. NPDR classification for this stage is mild to moderate. The incident at *Meda Dhatu Kshaya* known as *Sandhi Shunyata* forms the basis of the third *Patala*. It is associated with loss of junctional cell proteins, problems in cell-cell adhesion, and blood-retinal barrier breakdown. In this stage, exudate and macular edema are noticeable symptoms. *Asthi Ashrita*, the fourth *Patala Timira*, is the result of additional disease-related repercussions. *Majja* and *Asthi Dhatus* are involved since *Majja Dhatu* is also found in *Asthi Dhatu*. *Majja Dhatu* is vitiated in *Prameha*, however, *Asthi Dhatu* is not. *Tamah Pravesha* is a characteristic of *Majja Pradoshaja Vikara*. Anemia, hypoxia, and the formation of new blood vessels are the results of marrow depletion in the retinal tissues. *Shukra Dhatu*, which is *Majja Dushti*, leads to further *Dhatu Dushti. Dushta Apatya*, which demonstrates the disease's inherited course, is brought on by *Shukra Dushti*. *Chakshurendriya*'s reduced function is caused by *Oja Kshaya*. This kind of *Oja*, known as *Apara*, is in ten *Mahadhamani*. *Ashraya Ashrayi Bhava* states that when *Oja* is lost, *Dhamani* is also lost. This may be connected to aberrant apoptosis linked to *Oja Kshaya*, which results in capillary loss and thickening of the basement membrane in the inner blood-retinal barrier endothelial cell layers.

5. CONCLUSION

At various stages of the disease, *Pramehajanya Timira* affects the four internal *Drishti Patalas* of the eye, the presence of *Kledata* in the *Rakta* and *Raktavaha Srotas*, and the participation of the three *Doshas* and seven *Dhatu*. Due to prolonged uncontrolled hyperglycemia, two types of pathology in *Madhumeha*: *Dhatukshayajanya* and *Avaranajanya* play a crucial role in the development of DR. *Dhatus* are expelled from the body in *Dhatukshaya*, which leads to several pathogenic events and the development of DME. *Attipravritti*, *Sanga*, *Siragranthi*, and *Vimarga Gamana* are the four varieties of *Srotodusti* that is known to be important in the development of DR and macular edema.

6. ACKNOWLEDGMENTS

Nil.

7. AUTHORS' CONTRIBUTIONS

All the authors contributed equally in design and execution of the article.

8. FUNDING

Nil.

9. ETHICAL APPROVALS

This study is not required ethical clearance as it is review study.

10. CONFLICTS OF INTEREST

Nil.

REFERENCES

1. Tao Z, Shi A, Zhao J. Epidemiological perspectives of diabetes. Cell Biochem Biophys 2015;73:181-5.
2. World Health Organization. The Top 10 causes of Death. Available from: https://www.who.int/en/news-room/fact-sheets/detail/the-top-10-causes-of-death [Last accessed on 2023 Jul 10].
3. Barman P, Das M, Verma M. Epidemiology of type 2 diabetes mellitus and treatment utilization patterns among the elderly from the first wave of Longitudinal Aging study in India (2017-18) using a Heckman selection model. BMC Public Health 2023;23:699.
4. Vashist P, Senjam SS, Gupta V, Manna S, Gupta N, Shamanna BR, *et al.* Prevalence of diabetic retinopahty in India: Results from the National Survey 2015-19. Indian J Ophthalmol 2021;69:3087-94.
5. Lee R, Wong TY, Sabanayagam C. Epidemiology of diabetic retinopathy, diabetic macular edema and related vision loss. Eye Vis

(Lond) 2015;2:17.
6. Trikamji VA, editor. Charaka Saṃhita Elaborated by Charaka and Dridhabala with Ayurveda Dipika Commentary by Chakrapanidatta. 1st ed. Varanasi: Chaukhamba Prakashan; 2013. p. 212.
7. Pujyapada M. Chaturthapatala Netraprakashika. 1st ed. New Delhi: Kendriya Ayurved and Siddha Anusandhana, Parishad; 1999. p. 12.
8. Trikamji Y. Agnivesha. Charaka Samhita Sutrasthana. Matrashitiyo Adhyaya, Revised by Charaka & Dridhabala with Ayurveda Deepika Commentary by Chakrapanidatta. Ch. 5. Varanasi: Chaukhambha Prakashan; 2007.
9. Shrikantha Murthy KR. Vagbhata, Ashtanga Hridaya Sutrasthana. Doshabhediya Adhyaya. Edited by Kaviraj Atridev Gupta, translated into English. Ch. 12. Varanasi: Chaukhambha Publication; 2007.
10. Sahoo PK, Fiaz S. Conceptual analysis of diabetic retinopathy in Ayurveda. J Ayurveda Integr Med 2017;8:122-31.
11. Trikamaji Y. Sushruta. Sushruta Samhita Uttartantra. Aupadrawika Adhyaya with Nibandha Samgraha commentary by Dalhana. Ch. 1. Varanasi: Chaukhambha Orientalia; 2009.
12. Trikamji Y. Agnivesha. Charaka Samhita Chikitsasthana. Vatavyadhi Chikitsa Adhyaya, Revised by Charaka & Dridhabala with Ayurveda Deepika Commentary by Chakrapanidatta. Ch. 28. Varanasi: Chaukhambha Prakashan; 2007.
13. Trikamji Y. Agnivesha. Charaka Samhita Vimanasthana. Trividhakukshiyam Adhyaya, Revised by Charaka & Dridhabala with Ayurveda Deepika Commentary by Chakrapanidatta. Edited by Yadavaji Trikamji. Ch. 2. Varanasi: Chaukhambha Prakashan; 2007.
14. Sharma AR. Sushruta Samhita Edited with Susrutavimarsini Hindi Commentary, Uttar Tantra. Ch. 1. Aupdravikam Adhyaya 1/17. Varanasi: Chaukhambha Sanskrit Sansthan; 2013. p. 8.
15. Shastri KA. Susruta, Susruta Samhita, Sutra Sthana 33/4, Ayurveda Tattva Sandipika, Hindi Commentary. Part I. Varanasi: Chaukhambha Vishvabharati; 2012. p. 163.
16. Tripathi B. Vagbhata, Astanga Hridya, Nidana Sthana 8/30, Nirmala Hindi Commentary. Delhi: Chaukhamba Sansrita Pratishthana; 2014. p. 487.
17. Tripathy B, editor. Caraka Samhita of Agnivesha, Charaka Chandrika Hindi Commentary. Chikitsa Sthana; Vatavyadhi Chikitsa. 1st ed., Ch. 28. Verse 58. Varanasi: Chaukhamba Orientalia; 1999. p. 948.

How to cite this article:
Tripathi A, Fiaz S, Sharma S. A Comprehensive Review of Diabetic Retinopathy and Diabetic Macular Edema from an Ayurveda Point of View. IRJAY. [online] 2023;6(11);61-64.
Available from: https://irjay.com
DOI link- https://doi.org/10.47223/IRJAY.2023.61113