

Managing Age-Related Macular Degeneration and Diabetic Macular Edema: A Comprehensive Update for Clinical Pharmacists

Rajesh Hadia*, Rahul Trivedi, Sunil Kardani, Sunil Baile, Cyril Sajan, Varunsingh Saggi, Hemrajsingh Rajput

Department of Pharmacy, Sumandeep Vidyapeeth (Deemed to be University), Vadodara, Gujarat, INDIA.

ABSTRACT

The prevalence of both Age-related Macular Degeneration (AMD) and Diabetic Macular Edema (DME), are notably high, given the significant morbidity they generate and the burden placed on healthcare systems globally. Advancements in the treatment of these diseases are evident with anti-VEGF therapies, sustained-release implants as well as novel treatments which target the complement system and gene therapy. Pharmacists play a crucial role in this changing environment, by educating and counsel patients; promoting adherence to complex treatment regimens; delivering targeted care to optimize outcomes. They assist in side effects monitoring, overseeing medication regimens, and working with ophthalmologists as well as other health care providers to improve treatment efficacy of patients. New treatments for DME continue to advance and early trials of wet and or dry AMD therapies emerges, so it is vital that pharmacists have an updated understanding in order to provide support based on evidence-based knowledge which will help the overall care plan. Pharmacists who become more involved in patient care can improve treatment outcomes, protect vision and enhance the quality of life for a significant proportion of people with these chronic eye diseases.

Keywords: Age-Related Macular Degeneration (AMD), Diabetic Macular Edema (DME), Anti-VEGF therapy, Pharmacist's role in retinal diseases, Sustained-release implants, Gene therapy in AMD and DME.

Correspondence:

Dr. Rajesh Hadia

Assistant Professor, Pharmacy Practice,
Department of Pharmacy, Sumandeep
Vidyapeeth (Deemed to be University),
Vadodara-391760, Gujarat, INDIA.
Email: docrajesh.hadia@gmail.com

Received: 14-11-2024;

Revised: 08-01-2025;

Accepted: 08-04-2025.

INTRODUCTION

An international study published in the Lancet journal showed that 196 million people had Age-related Macular Degeneration (AMD) and Diabetic Macular Edema (DME), two of today's leading causes of vision loss worldwide, associated with a marked reduction their quality of life. Pharmacists are important members in the multidisciplinary care team who can touch all aspects of managing these conditions. I hope that this review will provide pharmacists with a more comprehensive understanding of the current and emerging treatment options for both AMD and DME, thereby enabling them to ensure patients receive maximum benefits. Age-Related Macular Degeneration (AMD): AMD is categorized into exudative and nonexudative types which are also called the wet type and dry respectively (Fernandes *et al.*, 2022). Abnormal neovascularization and fluid leakage with loss of vision are the characteristic features in wet AMD, whereas dry AMD is by drusen formation followed eventually by atrophy

including Retinal Pigment Epithelial (RPE) cell layer degeneration causing Geographic Atrophy (GA) (Borchert *et al.*, 2024). Updated Treatment Landscape for AMD: Exudative (Wet) AMD treatment has been transformed by the emergence of intravitreal anti-Vascular Endothelial Growth Factor (anti-VEGF) therapies (Tan *et al.*, 2022; Moon *et al.*, 2023). This new approach, utilizing medications like ranibizumab, aflibercept, brolucizumab, and off-label bevacizumab, has significantly enhanced visual acuity and lowered the risk of vision loss in comparison to previous methods like photodynamic therapy. Although anti-VEGF agents have proven effective, they come with challenges such as the necessity for frequent intravitreal injections, which can be taxing for both patients and the healthcare system (Tan *et al.*, 2022). To tackle these issues, newer anti-VEGF drugs with extended dosing schedules, such as brolucizumab and faricimab, have been created to potentially ease the treatment burden (Ferro *et al.*, 2023; Kumar *et al.*, 2024). Moreover, combination therapies that involve anti-VEGF agents and laser treatments are being explored as a strategy to boost treatment effectiveness and potentially reduce injection frequency (Fernandes *et al.*, 2022). Nonexudative (Dry) AMD: While advancements in managing wet AMD have been notable, treating dry AMD, especially late-stage geographic atrophy (GA), has historically



DOI: 10.5530/ijpi.20250310

Copyright Information :

Copyright Author (s) 2025 Distributed under
Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia. [www.mstechnomedia.com]

posed greater challenges (Borchert *et al.*, 2024; Girgis *et al.*, 2023). In the past, there were no approved treatments for dry AMD or GA (Wheeler *et al.*, 2024). However, the landscape has shifted following the recent FDA approval of two treatments for GA: pegcetacoplan and avacincaptad pegol. These agents target specific proteins in the complement cascade, a key player in the pathogenesis of dry AMD (Wheeler *et al.*, 2024; Piewak *et al.*, 2024). Apart from the approved treatments, ongoing clinical trials are exploring diverse therapeutic approaches for dry AMD, including complement system inhibitors, gene therapy, stem cell therapy, laser therapy, and surgical implants. These emerging therapies offer promise for earlier intervention and enhanced management of dry AMD (Borchert *et al.*, 2024; Wheeler *et al.*, 2024; Piewak *et al.*, 2024). Diabetic Macular Edema (DME) represents a significant complication of diabetic retinopathy that results in vision impairment (Mitta *et al.*, 2023; Chauhan *et al.*, 2022). The development of DME is influenced by a complex interaction of factors, including disruption of the blood-retinal barrier, increased vascular permeability, and elevated levels of various growth factors like VEGF and inflammatory mediators (Chauhan *et al.*, 2022; Okonkwo *et al.*, 2022). Current treatment approaches for Diabetic Macular Edema (DME) have evolved significantly in recent years. Transitioning from traditional laser photocoagulation to intravitreal pharmacotherapy has marked a substantial advancement (Okonkwo *et al.*, 2022; Jusufbegovic *et al.*, 2015). Anti-VEGF Therapies: Intravitreal agents targeting Vascular Endothelial Growth Factor (VEGF) such as ranibizumab, aflibercept, and off-label bevacizumab have emerged as the primary treatment modality for managing DME. These therapies demonstrate notable enhancements in visual acuity and reduction in macular edema levels (Okonkwo *et al.*, 2022; Haridoss *et al.*, 2017). By targeting the VEGF pathway, these medications address a crucial aspect of DME pathogenesis (Chauhan *et al.*, 2022; Cheema *et al.*, 2024).

Corticosteroids: In cases where DME shows resistance to anti-VEGF treatments, intravitreal corticosteroids like triamcinolone acetonide, dexamethasone, and fluocinolone acetonide are utilized in management (Salvetat *et al.*, 2024; Spinetta *et al.*, 2023). **Combination Therapies:** Ongoing investigations focus on combination approaches that pair VEGF inhibition with laser photocoagulation or corticosteroids as adjunctive therapies. Such strategies aim to optimize treatment outcomes and potentially streamline the treatment process (Adelman *et al.*, 2015; Park *et al.*, 2014). **Emerging Therapies for Diabetic Macular Edema:** Despite the progress in managing Diabetic Macular Edema (DME), some patients still do not have optimal responses to current treatments, underscoring the importance of ongoing research and development of new therapies (Chauhan *et al.*, 2022; Chen *et al.*, 2014). Current clinical trials are examining alternative pharmaceutical agents that target different pathways, such as the kallikrein-kinin system, angiotensin-Tie2 system, and neuroprotective agents (Chauhan *et al.*, 2022; Czach *et*

al., 2024). Furthermore, innovative drug delivery methods, such as sustained-release implants and topical formulations, are being investigated to enhance treatment effectiveness and lessen treatment burdens (Kim *et al.*, 2021; Sarao *et al.*, 2018). **Pharmacists' Role in the Management of AMD and DME:** Pharmacists play a critical role in overseeing the treatment of AMD and DME, contributing to enhanced patient outcomes and decreased healthcare expenses. **Educating Patients and Managing Medications:** Pharmacists are well-equipped to educate patients about the diseases' progression, available treatments, and proper medication administration techniques for both AMD and DME (Kamal *et al.*, 2023; Almony, 2023). They can also aid in medication management by ensuring correct dosing, monitoring for adverse reactions, and encouraging adherence to the prescribed treatment plan. **Managing Formularies and Implementing Cost-Efficient Approaches:** Pharmacists, as part of the managed care team, are crucial in managing drug formularies and implementing utilization strategies to enhance access to cost-effective treatment options for AMD and DME (Kamal *et al.*, 2023). This involves evaluating the comparative effectiveness, safety, and cost-efficiency of different treatment approaches. **Collaborating with the Healthcare Team:** Pharmacists play a pivotal role in the comprehensive care of AMD and DME patients by collaborating with ophthalmologists, retinal specialists, and other healthcare professionals to optimize patient care (Almony, 2023). This collaborative effort ensures timely referrals, proper treatment initiation, and effective monitoring of patient progress. **Keeping Abreast of New Treatments:** Given the evolving landscape of AMD and DME management, it is vital for pharmacists to stay updated on the latest treatment options, dosing protocols, and emerging therapies (Tan *et al.*, 2022; Kumar *et al.*, 2024). This knowledge equips pharmacists to offer evidence-based recommendations to patients and healthcare providers comprehensively. **Need for the study:** AMD and DME are significant causes of visual impairment, both globally leading to millions severely debilitating the quality of life. In light of the novel treatments anti-VEGF agents, sustained-release implants, and gene therapies altering choices for management options in treating these conditions over the past decade-plus decades (boils down to helping patients achieve optimal care through patient adherence maximization/ side effect mitigation/patient education), pharmacists are integral part here. As it stands, with many patients not responding effectively to current treatments, pharmacists should inform themselves well on new options in order provide the most appropriate care for each patient. This review article offers pharmacists current data to help optimize patient outcomes and facilitate strong interprofessional collaboration. **Purpose and Significance of the study:** Age-Related Macular Degeneration (AMD) and Diabetic Macular Edema (DME), are two of the major causes of visual acuity loss worldwide, affecting >196 million people with ensuing adverse consequences in terms quality-of-life EOF increased resource demands. Being

an integral part of the multidisciplinary care team pharmacists can, in turn, also be important stakeholders to act as activators for appropriate management regarding various measures including medication adherence and patient education due to their role at critical interface that influences health outcomes. Current treatments have made great strides in the last decades especially with recently approved anti-VEGF agents, sustained-release implants and gene therapies; however many patients continue to suffer debilitating consequences such as frequent intravitreal injections for years on end or suboptimal responses from current treatment modalities along with new logistical and financial challenges. As they do, pharmacists will have a key role to play in maximizing the value of treatment regimens and monitoring for adverse effects with established as well emerging AMD- & DME-targeted therapies. The aim of this review article is to equip the pharmacist with insights on current treatment landscape for AMD and DME, in order that they be well positioned to make appropriate decisions along-side other healthcare providers. Given the changing landscape of treatment options, including new prolonged-acting anti Vascular Endothelial Growth Factor (VEGF) agents, combinations therapies and unique drug delivery platforms it is important for pharmacists to be informed on these therapeutic advancements in order to incorporate knowledge into clinical practice. Finally, it emphasizes the need for individualized patient care strategies, especially in case of non-responders to first-line therapies and underscores a holistic approach from pharmacists towards the entire continuum of cancer patients. Pharmacists have an important role in patient education, therapy management and care coordination of patients with these chronic retinal diseases for improved outcomes.

DISCUSSION

The management of Age-Related Macular Degeneration (AMD) and Diabetic Macular Edema (DME) is rapidly advancing, characterized by notable progress in pharmacotherapy, innovative drug delivery methods, and personalized care strategies. Pharmacists play a vital role in patient care, guiding individuals through the complexities of treatment, promoting adherence, and enhancing outcomes. Mitta *et al.*, 2023 emphasize the potential of topical treatments in neovascular AMD (nAMD) as a minimally invasive option compared to the current standard of intravitreal injections. Although these treatments are still in development, they have the potential to enhance patient compliance by reducing the need for frequent invasive procedures, providing pharmacists with an opportunity to assist patients in transitioning to new therapeutic alternatives (Mitta *et al.*, 2023). For instance, focusing on the management of Geographic Atrophy (GA), an advanced form of dry AMD with marked coverage across various articles considered by Borchert *et al.*, 2024 tackled optogenetic therapy for vision restoration. It is a topically, locally-delivered treatment that modifies retinal cells for increased light sensitivity; it could revolutionize AMD care. Pharmacists should be ready to educate

patients on these advances and advise them about managing expectations of availability and efficacy (Borchert *et al.*, 2024). Tan *et al.*, 2022 offers a comprehensive review of the conventional anti-VEGF treatments, like ranibizumab and aflibercept, which are known for their high efficacy but can be burdensome due to the frequent need for injections. Emerging therapies, such as sustained-release implants and gene therapy, are designed to extend treatment intervals, providing an opportunity for pharmacists to assist patients in adhering to these novel regimens and enhancing overall patient care (Tan *et al.*, 2022). Expanding upon this, Moon *et al.*, 2023 reviewed two decades of anti-VEGF therapy progress in nAMD. They note that while those treatments have revolutionized control of the disease, limitations remain for some people including inadequate response and ongoing vision loss in others. The study confirms the need for further research on longer-lasting treatment, which is something pharmacists can help patients understand to better set their expectations (Moon *et al.*, 2023). In 2023, Ferro Desideri and co-workers presented faricimab as a dual-acting antibody that targets not only VEGF-A but also the Ang-Tie2 pathway. Dosing every 4 or even few to posters may provide significant utility as a novel treatment option for nAMD. Balancing the need for frequent injections faricimab is effective at reducing with comprehensive patient education: discussing this breakthrough therapy and helping patients navigate both clinical benefits of and risks associated with transitioning to a new, complex treatment regimen (Ferro *et al.*, 2023).

The management of Diabetic Macular Edema (DME) has seen significant advancement with the use of anti-VEGF therapy, lasers and new emerging therapies. Each of these therapeutic approaches poses unique opportunities and challenges for the pharmacist involved in patient care. According to Chauhan *et al.*, 2022, anti-VEGF drugs such as ranibizumab, and bevacizumab have been found to increase the rate at which outcomes can positively change for many people with DME. Yet current treatments are not universally effective and some patients require repeat operations, making alternative strategies including gene therapy, stem cell therapy or drugs that target inflammatory pathways attractive. The emergence of these novel therapies has the potential to change patient outcomes and innovate tailoring therapeutic strategies on an individualized basis, so knowledge expertise amongst pharmacists are essential for managing patients whom remain non-responsive (Chauhan *et al.*, 2022). Okonkwo *et al.*, 2022 outline the shift from laser photocoagulation to intravitreal injections as the gold standard in treating DME. Although intravitreal injections, since the advent of anti-VEGF (Vascular Endothelial Growth Factor) agents have revolutionized visual outcomes for many retinal diseases, they also result in new challenges such as increased clinic visits and treatment burden due to frequent need for re-treatment. Pharmacists have the opportunity to support patient adherence to these treatment schedules by providing education on the importance of consistent

follow-up care for optimal therapeutic outcomes (Okonkwo *et al.*, 2022). Also, Jusufbegovic *et al.*, 2015 retrospectively analysed treatment options in DME over a period of ten years. Their discovery showed that visual results were superior with intravitreal injections compared to laser but created more demand for clinic visits and, thus additional pressure on healthcare systems. Pharmacists can play an important role in reducing these logistical hurdles by providing scheduling assistance and advocating for treatment compliance (Jusufbegovic *et al.*, 2015). In the study by Haridoss *et al.*, (2017) reviewed on aflibercept had been originated as successful anti-VEGF strategy for DME They noted that aflibercept offers better clinical results as compared to laser photocoagulation. Although efficacious, like other anti-VEGFs the need for multiple shots remains a challenge to long-term adherence. Pharmacists should be in the forefront of advising patients on solutions that they can take to alleviate this burden (possible alternative strategies which could ultimately enable extended dosing intervals or novel drug delivery devices, reducing injection frequency but maintaining efficacy) (Haridoss *et al.*, 2017). Cheema and Cheema (2024) underscore the critical importance of anti-VEGF medications such as ranibizumab, bevacizumab, and aflibercept in the management of DME. Pharmacists play a vital role in monitoring patients for potential adverse effects, such as elevated intraocular pressure or endophthalmitis, and in ensuring compliance with these intricate, long-term treatment protocols (Cheema *et al.*, 2024). Salvetat *et al.*, in 2024, expanded indication for intravitreal steroids in the treatment of Diabetic Macular Edema (DME) especially those patient who have NO response to anti-VEGF therapies. Although these results are promising, triamcinolone and dexamethasone implants have the disadvantages of a raise in intraocular pressure along with an associated risk for development of cataracts. Avoidance of patients at high risk and careful monitoring are therefore important. Pharmacists are responsible for educating patients about these hazards, and must work with other health-care professionals to monitor appropriately throughout the treatment (Salvetat *et al.*, 2024). Spinetta *et al.*, 2023 also underscores the effectiveness of dexamethasone implants, especially in patients with elevated inflammatory biomarkers or individuals who have not shown improvement with anti-VEGF therapy. Pharmacists play a crucial role in guiding the selection of suitable treatments for each patient according to their clinical characteristics, guaranteeing that patients are well-versed in both the advantages and drawbacks of their therapeutic alternatives (Spinetta *et al.*, 2023). Adelman and colleagues (2015) conducted a comparative analysis of different treatment approaches for DME. They suggest that while anti-VEGF treatments are highly effective for many patients, some individuals may find greater benefit from surgical procedures like vitrectomy with internal limiting membrane peeling. It is essential for pharmacists to closely collaborate with ophthalmologists and other healthcare professionals to ensure that patients receive the most appropriate

and efficient treatment tailored to their condition and response to prior therapies (Adelman *et al.*, 2015). Finally, Park *et al.*, 2014, the continuing importance of laser photocoagulation in the management of diabetic macular oedema. Although laser has largely been supplanted by pharmaceutical treatments as the main modality, adjunctive use of lasers combined with pharmacologic agents in selected cases may provide superior outcomes. Pharmacist should be familiar with both and recommend combinations when applicable, to increase patient outcomes (Park *et al.*, 2014). Innovations in drug delivery systems and personalized care are quickly changing how Age-Related Macular Degeneration (AMD) and Diabetic Macular Edema (DME) are managed. Pharmacists, as primary healthcare providers, have a crucial role in educating patients, promoting adherence to treatment, and customizing treatments to meet individual needs. A recent literature review highlights significant advancements and the increasing importance of pharmacists in improving patient outcomes. The necessity of individualized treatment plans, especially for patients with DME who are refractory to classic anti-VEGF therapies is underscored by Chen (2020). In short, the study proposes looking for new avenues such as through pathways of plasma kallikrein kinin system and inflammation. Such innovative therapies provide hope for non-responsive patients, thus highlighting the necessity that each pharmacist is aware of these novel options in order to deliver sensitivity-specific treatment. This enable pharmacists to direct treatments accordingly based on the new pathways advent in order to maximally impact patient outcomes and improve drug efficacy (Chen *et al.*, 2014). For example, Czach and colleagues (2024) provide an extensive overview of a number of Diabetic Macular Edema (DME) treatments on the near horizon such as brolicizumab and faricimab which reduce injection frequency compared to current therapies therefore burdening patients less with treatment. These combination agents offer a broader range in the management of DME by addressing both primary and secondary disease pathways. Finally, second-line options for patients refractory to primary anti-VEGF treatments are given due consideration in the form of corticosteroids and laser. Given the expanding treatment options, however, it is increasingly important for pharmacists to have accurate knowledge of all available treatments in order deliver personalized and meaningful healthcare (Czach *et al.*, 2024). In a review by Kim and Woo (2021), drug delivery systems that are filed in to prevent the chronicity of AMD and DME, gain significance. Via nanoparticles, hydrogels and extended-release preparations these systems are being developed to decrease the burden of injections. They also might help improve patient compliance by reducing the number of treatments needed (by extending drug action). Pharmacists play an important role in patient education about recent advances that reduce the treatment burden, including their benefits and how they can be individualized for each patient (Kim *et al.*, 2021). Managing macular edema in diabetic patients undergoing

cataract surgery presents unique challenges, as discussed by Sarao *et al.*, 2018. The authors stress the importance of utilizing topical NSAIDs to prevent pseudophakic cystoid macular edema, especially in high-risk patients, and suggest intravitreal anti-VEGF therapies for those with pre-existing DME. Pharmacists are instrumental in guiding treatment decisions for these patients, ensuring proper post-surgical care, and optimizing the therapeutic regimen to avert complications (Sarao *et al.*, 2018). In Kamal (2023) considers the issues faced by managed care in managing nAMD and DME, looking particularly at value-cost strategies for optimal nAMD treatments. With the ever-rising costs related to regular anti-VEGF injections, careful formulary management and drug utilization strategies are required. A key part of this process is the involvement of pharmacists to enable patients access high quality treatment for affordable price. They are key in balancing good clinical effectiveness and value for money, both of which need to be considered with respect to health care resources utilization (Kamal *et al.*, 2023). Almony (2023) Known issue Regarding Patient Adherence to Anti-VEGF Therapy Relates Oddly To Financial And Logistical Disadvantage of Frequent Injections The findings highlight the importance of pharmacist-led interventions like educating patients and developing tailored care plans to overcome such barriers. By providing preventative teaching and support, pharmacists are therefore critical to reducing the treatment load, thereby really maximizing long-term adherence as well not only ensuring your victims continue participating in their individual health (Almony, 2023).

CONCLUSION

Age-related Macular Degeneration (AMD) and Diabetic Macular Edema (DME) are the commonest causes of vision loss globally, which have a devastating impact on patient's quality of life as well as substantial burden to healthcare. The landscape of AMD and DME disease management has been revolutionized with molecular-targeted anti-VEGF therapies, sustained-release implants for the posterior segment, as well novel agents such complement system inhibitors and gene therapy on their way toward FDA approval. Pharmacists are essential change agents in this evolving landscape by educating and counseling patients, increasing adherence and tailoring care to improve outcomes. They play a critical role in managing treatment strategies, moderating side effects, and collaborating with ophthalmologists and other health care professionals to provide the most effective, individualized treatments. The continued evolution of DME therapies as well as novel treatments for both wet and dry AMD make it important that pharmacists remain up to date on the current state. Pharmacists can improve treatment outcomes, visual health and overall patient quality of life by being part of a team dedicated to direct management in patient care.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

AMD: Age-Related Macular Degeneration; **DME:** Diabetic Macular Edema; **VEGF:** Vascular Endothelial Growth Factor; **RPE:** Retinal Pigment Epithelium; **GA:** Geographic Atrophy; **FDA:** Food and Drug Administration; **nAMD:** Neovascular Age-Related Macular Degeneration; **NSAIDs:** Non-Steroidal Anti-Inflammatory Drugs.

REFERENCES

- Adelman, R. A., Parnes, A. J., Michalewska, Z., Parolini, B., Boscher, C., & Ducournau, D. (2015). Strategy for the management of diabetic macular edema: The European Vitreo-Retinal Society Macular edema Study. *BioMed Research International*, 2015, Article 352487. <https://doi.org/10.1155/2015/352487>
- Almony, A. (2023). Treatment approaches for neovascular age-related macular degeneration and diabetic macular edema. *The American Journal of Managed Care*, 29(6) (Suppl.), S81–S89. <https://doi.org/10.37765/ajmc.2023.89386>
- Borchert, G. A., Shamsnajafabadi, H., Ng, B. W. J., Xue, K., De Silva, S. R., Downes, S. M., MacLaren, R. E., & Cehajic-Kapetanovic, J. (2024). Age-related macular degeneration: Suitability of optogenetic therapy for geographic atrophy. *Frontiers in Neuroscience*, 18, Article 1415575. <https://doi.org/10.3389/fnins.2024.1415575>
- Chauhan, M. Z., Rather, P. A., Samarah, S. M., Elhousseiny, A. M., & Sallam, A. B. (2022). Current and novel therapeutic approaches for treatment of diabetic macular edema. *Cells*, 11(12), 1950. <https://doi.org/10.3390/cells11121950>
- Cheema, A. A., & Cheema, H. R. (2024). Diabetic macular edema management: A review of anti-vascular endothelial growth factor (VEGF) therapies. *Cureus*, 16(1), Article e52676. <https://doi.org/10.7759/cureus.52676>
- Chen, C. (2020). Attach importance to individualized treatment of diabetic macular edema. *Chinese Medical Journal (English Edition)*, 10, 1005–1015. <https://doi.org/10.3760/CMA.J.ISSN.1005-1015.2020.02.001>
- Czach, Z., Czach, M., Bachurska, D., Kopacz, W., Mazurek, Ł., Stradczuk, M., Mazurek, W., Rękas, B., Kruczyk, B., Piętak, M., & Ołędzka, J. (2024). Advancements in the treatment of diabetic macular edema: Current strategies and future directions. *Journal of Education, Health and Sport*, 73. <https://doi.org/10.12775/JEHS.2024.73.51687>
- Fernandes, A. R., Zielińska, A., Sánchez-López, E., dos Santos, T., García, M. L., Silva, A. M., Karczewski, J., & Souto, E. B. (2022). Exudative versus nonexudative age-related macular degeneration: Physiopathology and treatment options. *International Journal of Molecular Sciences*, 23(5), 2592. <https://doi.org/10.3390/ijms23052592>
- Ferro Desideri, L., Traverso, C. E., Nicolò, M., & Munk, M. R. (2023). Faricimab for the treatment of diabetic macular edema and neovascular age-related macular degeneration. *Pharmaceutics*, 15(5), 1413. <https://doi.org/10.3390/pharmaceutics15051413>
- Girgis, S., & Lee, L. R. (2023). Treatment of dry age-related macular degeneration: A review. *Clinical and Experimental Ophthalmology*, 51(8), 835–852. <https://doi.org/10.1111/ceo.14294>
- Haridoss, S., Sundaram, S. M., George, M., & Sriram, D. K. (2017). Aflibercept for diabetic macular edema: A concise review. *International Journal of Basic and Clinical Pharmacology*, 6(5), 764–767. <https://doi.org/10.18203/2319-2003.IJBPCP20171652>
- Jusufbegovic, D., Mugavin, M. O., & Schaal, S. (2015). Evolution of controlling diabetic retinopathy: Changing trends in the management of diabetic macular edema at a single institution over the past decade. *Retina*, 35(5), 929–934. <https://doi.org/10.1097/IAE.0000000000000438>
- Kamal, K. M. (2023). The role of managed care professionals in the management of neovascular age-related macular degeneration and diabetic macular edema. *The American Journal of Managed Care*, 29(6) (Suppl.), S90–S95. <https://doi.org/10.37765/ajmc.2023.89385>
- Kim, H. M., & Woo, S. J. (2021). Ocular drug delivery to the retina: Current innovations and future perspectives. *Pharmaceutics*, 13(1), 108. <https://doi.org/10.3390/pharmaceutics13010108>
- Kumar, A., Ferro Desideri, L., Ting, M. Y. L., & Anguita, R. (2024). Perspectives on the currently available pharmacotherapy for wet macular degeneration. *Expert Opinion on Pharmacotherapy*, 25(6), 755–767. <https://doi.org/10.1080/14665666.2024.2354921>
- Mitta, P., Lamaa, D., Fabre, M., Ronco, C., Benhida, R., Demange, L., & Charrueau, C. (2023). Topical treatment for age-related macular degeneration: Where are we now? *Medicine Science*. <https://doi.org/10.1051/medsci/2023177>
- Moon, B.-H., Kim, Y., & Kim, S.-Y. (2023). Twenty years of anti-vascular endothelial growth factor therapeutics in neovascular age-related macular degeneration

- treatment. *International Journal of Molecular Sciences*, 24(16), Article 13004. <https://doi.org/10.3390/ijms241613004>
- Okonkwo, O. N., Akanbi, T., & Agweye, C. T. (2022). Current management of diabetic macular edema. *IntechOpen*. <https://doi.org/10.5772/intechopen.100157>
- Park, Y. G., Kim, E. Y., & Roh, Y. J. (2014). Laser-based strategies to treat diabetic macular edema: History and new promising therapies. *Journal of Ophthalmology*, 2014, Article 769213. <https://doi.org/10.1155/2014/769213>
- Piewak, D., Drzyzga, D., Dorecka, M., & Wygldowska-Promieska, D. (2024). Summary of the therapeutic options for patients with dry and neovascular AMD. *Journal of Clinical Medicine*, 13(14), 4427. <https://doi.org/10.3390/jcm13144227>
- Salvetat, M. L., Pellegrini, F., Spadea, L., Salati, C., Musa, M., Gagliano, C., & Zeppieri, M. (2024). The treatment of diabetic retinal edema with intravitreal steroids: How and when. *Journal of Clinical Medicine*, 13(5), 1327. <https://doi.org/10.3390/jcm13051327>
- Sarao, V., Veritti, D., Maurutto, E., Rassa, N., Borrelli, E., Loewenstein, A., Sadda, S., & Lanzetta, P. (2018). Pharmacotherapeutic management of macular edema in diabetic subjects undergoing cataract surgery. *Expert Opinion on Pharmacotherapy*, 19(14), 1551–1563. <https://doi.org/10.1080/14656566.2018.1516206>
- Spinetta, R., Petrillo, F., Reibaldi, M., Tortori, A., Mazzoni, M., Metrangolo, C., Gelormini, F., Ricardi, F., & Giordano, A. (2023). Intravitreal DEX implant for the treatment of diabetic macular edema: A review of national consensus. *Pharmaceutics*, 15(10), 2461. <https://doi.org/10.3390/pharmaceutics15102461>
- Tan, C. S. H., Ngo, W. K., Chay, I. W., Ting, D. S., & Sadda, S. R. (2022). Neovascular age-related macular degeneration (nAMD): A review of emerging treatment options. *Clinical Ophthalmology*, 16, 917–933. <https://doi.org/10.2147/OPHTH.S231913>
- Wheeler, S., Mahmoudzadeh, R., & Randolph, J. (2024). Treatment for dry age-related macular degeneration: Where we stand in 2024. *Current Opinion in Ophthalmology*, 35(5), 359–364. <https://doi.org/10.1097/ICU.0000000000001064>

Cite this article: Hadia R, Trivedi R, Kardani S, Baile S, Sajan C, Saggu V, Rajput H. Managing Age-Related Macular Degeneration and Diabetic Macular Edema: A Comprehensive Update for Clinical Pharmacists. *Int. J. Pharm. Investigation*. 2025;15(3):858-63.