ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

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The Recent Studies on the Prevention of Hereditary Transmission in Age-Related Macular Degeneration: Methodological Research, Retrospective Validation Study

Yaşa Bağlı Makula Dejeneresansında Genetik Geçişten Korunmak ile İlgili Son Çalışmalar: Metodolojik Araştırma, Retrospektif Doğrulama Çalışması

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ABSTRACT Objective: This study focused on the prevention of hereditary transmission in senile macular degeneration and conducted a comprehensive evaluation of recent research publications released between 2019 and 2023. **Material and Methods:** Medical Subject Headings terms and keywords associated with genetic transmission, macular degeneration therapies, and preventative measures were applied to search PubMed and Google Scholar. The review's objectives were to uncover pertinent literature, describe distinctive qualities, and evaluate findings concerning hereditary transmission prevention in Türkiye. **Results:** This study includes methodological research, retrospective validation studies, and the data were published by PubMed, Google Scholar, SCOPUS, WoS, and Google Academic research between 2019 and 2023. Studies highlighting this prevention were covered by the inclusion criteria, while unrelated or non-English studies were excluded by the exclusion criteria. 18 papers were left, and sourced following a thorough search technique produced 107 papers from databases. **Conclusion:** This section highlighted a few recent research that covered several facets of preventing age-related macular degeneration (AMD). The complex character of AMD was underlined, highlighting the significance of genetics, environmental factors, oxidative stress, diet, mitochondrial health in the prevention and treatment of diseases that could result in vision loss. Besides that, treatment possibilities, such as anti-vascular endothelial growth factor therapy and induced pluripotent stem cells-based methods, were all discussed in the research.

Keywords: Senile macular degeneration; hereditary transmission; age-related macular degeneration

ÖZET Amaç: Bu çalışma, senil makula dejenerasyonunda kalıtsal bulaşının önlenmesine odaklanmış ve 2019-2023 yılları arasında yayımlanan son araştırma yayınlarının kapsamlı bir değerlendirmesi yapılmıştır. **Gereç ve Yöntemler:** Genetik geçiş, makula dejenerasyonu tedavileri ve önleyici tedbirlerle ilişkili Tıbbi Konu Başlıkları terimleri ve anahtar kelimeleri ele alınmış, Pub-Med ve Google Akademik'te arama yapmak için kullanılmıştır. İncelemenin amacı; ilgili literatürü ortaya çıkarmak, ayırt edici özellikleri tanımlamak ve Türkiye'de kalıtsal transmisyonun önlenmesine yönelik bulguları değerlendirmektir. **Bulgular:** Bu çalışma, metodolojik araştırmaları, geriye dönük doğrulama çalışmalarını içermekte olup, veriler 2019-2023 yılları arasında PubMed, Google Akademik, SCOPUS, WoS ve Google Akademik araştırmaları tarafından yayınlanmıştır. Bu önlemeyi vurgulayan çalışmalar dâhil edilme kriterleri kapsamına alınırken, ilgisiz veya İngilizce olmayan çalışmalar hariç tutma kriterlerine tabi tutuldu. Kapsamlı bir arama tekniğinin ardından veri tabanlarındaki 107 makaleden 18 tanesi kaldı ve kaynak alındı. **Sonuç:** Bu bölümde yaşa bağlı makula dejenerasyonunu (YBMD) önlemenin çeşitli yönlerini kapsayan birkaç yeni araştırma vurgulandı. YBMD'nin karmaşık karakterine dikkat çekilerek, görme kaybına neden olabilecek hastalıkların önlenmesinde ve tedavisinde genetiğin, çevresel faktörlerin, oksidatif stresin, diyetin, mitokondri sağlığının önemi vurgulandı. Ayrıca araştırmada antivasküler endotelyal büyüme faktörü tedavisi ve indüklenmiş pluripotent kök hücrelere dayalı metotlar da tartışıldı.

Anahtar Kelimeler: Senil makula dejenerasyonu; kalıtsal geçiş; yaşa bağlı makula dejenerasyonu

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Age-related macular degeneration (AMD) is one of the biggest causes of irremediable amaurosis. The disease is clinically characterized as one of the fatal eye diseases which affects retina, specifically the macula resulting in fuzzy or blurry vision. In today's world, AMD is one of the greatest reasons for weak vision in elderly people. Medical surveys and studies reveal that one-in-eight people in the senior age group get affected by this disease and experience irreversible blindness. Due to the rapidly growing ratio of AMD patients, it is also estimated that approximately 200 million people are likely to be impacted by AMD over 2040.[1] The demographic shift brought on by the increasing aging population can be used as a base to understand the prevalence of this illness in the younger population. Because of its adverse side effects, long-term vision problems, and management, AMD is becoming a major concern in the public and private health sectors of both developing and developed countries. With the growing cases, the socioeconomic consequences associated with the disease are also turning into a matter of great concern.[2] Degenerative disease is associated with the adulating process. The aging phenomenon is considered one of the major reasons for developing AMD. The drastically growing demographic gap in the form of young and elder population differences resulted in a higher number of AMD cases. The other health-related conditions that are found in a strong link with the sickness include smoking habits, body mass index, cataract surgery, fibrinogen, vascular diseases, and high-density lipoprotein cholesterol condition.[2] The presence and intensity of these health conditions significantly impact the development of AMD. Along with age, diet, and smoking habits, genetics play a strong role in transferring and developing AMD. The medical surveys and scientific trials proved that AMD runs in genetics and some races contain strong genes i.e., Asia and European descendent. The variations of the disease also confirmed that genetics are one of the dominant causes behind acute AMD cases. The study carried out by AMD Gene Consortium revealed that the genetic variations associated with AMD are characterized by new hereditary regions that are controlling the likeability of genes ("Seven new loci associated with AMD," 2013). The inheritable variation however to get impacted by other factor and change over with the biological aging phenomenon which needs to be explored to develop new remedies and treatment strategies. The risk factors also differ in terms of AMD condition i.e., Dry AMD and advanced-neovascular (wet) AMD. The situation of initial phase in AMD often appears as dry AMD which results in vision loss and developed to advance stages. While wet AMD on the other hand is the advanced and late stage of the disease where abnormal growth of blood vessels destroys the macula and results in fast vision loss.[3] Hereditary factors partially impact the nature and stage of the disease. Lifestyle and diet factors are among the top causes behind determining the stages and severity of disease. According to the reports by BrightFocus Foundation, AMD runs in genetics and every 3 in 4 develop the disease out of heredity. There are two genes that are found to be important in analyzing disease. Factor H and Factor B play a significant role in controlling the immune system and regulating inflammation. In almost 74% of AMD cases, both these genes are responsible for developing the conditions. The other genes involved in AMD development include the PLEKHAI gene, LOC387715 gene, HTRA1, and C3 variant. It is confirmed that people having respective gene variants possess a higher risk of growing AMD. As a result of the involvement of hereditary factors, scientific trials have been performed to make less the familial risk of AMD. It has occurred that lifestyle and eating habits can reduce the chances of disease in case of low-risk genetic variation. It is confirmed by Ho et al. that dietary intake with antioxidant properties can lower the hereditary risk of developing early AMD.[4] Healthy dietary habits are therefore observed as strong resistance to AMD genetic prevention. It is also argued that lifestyle quality, light exposure, and dietary risk factors are associated with the development of disease.[5] Taking a balanced supply of antioxidants in the form of vitamins and fatty acids and modifying dietary habits lower the gene-transmitted risk factor for growing AMD. Despite the presence of abundant research on AMD treatment and risk factors, no previous has been conducted to explore the issue in the context of Türkiye. The researcher, therefore, identified the gap and covered it by analyzing

the recent studies that encompass the preventive measures for genetic AMD. The researcher, therefore, aims to conduct a systematic review and provide an in-depth insight into the recent treatment and strategies for reducing the genetic risk factors of AMD in Türkiye.

MATERIAL AND METHODS

This essay was prepared in accordance with the principles of the Declaration of Helsinki. For this study, the approval of the ethics committee, dated 14th September 2023 and numbered 773, was obtained by the Medipol University Non-Interventional Clinical Research Ethics Committee, İstanbul, Türkiye. Studies released from 2019 to 2023 were looked for in PubMed (The National Center for Biotechnology Information, the U.S.) and Google Scholar (Google Co., the U.S.). We have developed a thorough search strategy to find pertinent studies. We have made use of resources like Google Scholar and PubMed and Included suitable Medical Subject Headings phrases and keywords associated with genetic transmission, preventative measures, and pertinent therapies for senile macular degeneration. Numerous "prevention of hereditary transmission in senile macular degeneration" related papers were included in this review.

SEARCH STRATEGY

The study utilizes a systematic review strategy to gather data through research papers that examine the recent studies of the prevention of hereditary transmission in senile macular degeneration. Any study is based on a collection of either primary or secondary data. As the research papers collected as data sources in the current study are already published, the current study is based on secondary data collection.[6]

Failing to perform a well-rounded and comprehensive search for an SLR can produce bias in the review results.[7] Therefore, it is advisable to overview the multiple databases available to researchers to extract the most relevant research.[8] The researcher has studied several available databases to select the most adequate and accurate indexes that can provide relevant papers on the topic of the prevention of hereditary transmission in senile macular degeneration in the context of Türkiye.

REVIEW AIM

This study's primary goal is to locate pertinent literature about preventing hereditary transmission of senile macular degeneration to define its own unique characteristics and examine its findings in relation to the prevention of hereditary transmission of AMD in Türkiye.

EXCLUSION/INCLUSION CRITERIA FOR REVIEW

Inclusion Criteria

The papers mainly focus on the prevention of hereditary transmission of AMD. Moreover, a time (2019 to 2023) of 4 years was selected for data collection. The domain (prevention of hereditary transmission of AMD) was focused on while searching for papers. However, papers with empirical methodologies were highly focused. Data type-conference papers, journal articles, meta-analyses, and reviews were included. This helped in having a clear direction for the selection of data. According to Ohadomere and Ogamba papers, with appropriate language must be included in SLR for better understanding, so papers only in English are included in this study.[9]

Exclusion Criteria

Studies that do not address the proposed research questions are excluded from this SLR.[6] Studies in languages other than English are excluded.[9] Moreover, studies, including video content, are also excluded to ensure the collection of adequate empirical evidence from past studies that mainly focused on personal views and are not supported by any statistics or references are excluded.[10] Besides, Studies not related to hereditary transmission prevention and studies published before 2019 were excluded.

SEARCH OUTCOMES AND DATA ANALYSIS

The retrieval process ran on the SCOPUS (The Elsevier Co., The Netherlands) and WoS (The Clarivate analytics Co., UK & USA) databases and collected 107 papers. Furthermore, the researcher extracted an additional 25 papers by searching on Google Scholar. An initial overview of the papers was done after uploading the references and 20 duplicates have been removed by applying the EndNote (The Clarivate analytics Co., UK & USA). After the remove of duplicated research, 87 studies were left behind. These 87 papers were scrutinized by overviewing their titles

and abstracts, and the removal of 21 papers was carried out due to irrelevancy (i.e., they did not discuss the prevention of hereditary transmission of AMD).

Furthermore, six papers were dropped due to language issues (i.e., published in languages other than English), ten were dropped as they did not fall in the sample timeframe. Therefore, 45 papers were scanned in full text, of which 15 were dropped.

RESULTS

AMD PREVENTATIVE MEASURES

Zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids are nutrients that may help lower the risk of becoming full early AMD. That illness may be avoided by shielding the eyes from excessive light, particularly UV and blue light. Diet, way of life, and exposure to light all play important parts in preventing AMD. Certain nutrition and light-protection techniques may help to reduce the chance of developing AMD.

NUTRIENTS INTAKE AND EATING HABITS

Numerous nutrients, including zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids, may help lower the chance of growing up early AMD, according to studies, a suggested dietary pyramid emphasizes the value of nutrient-rich foods for eye health, including fish, vegetables, fruits, and some oils.[5,11,12]

ENVIRONMENTAL AND GENETIC INFLUENCES

Genetic and environmental variables both play a role in the development of AMD.[13] The onset and course of AMD are significantly influenced by familial variations. Even though heredity plays a substantial role in the condition, it is still unclear whether genetic tests and polygenic scores can effectively direct treatment.

OXIDATIVE STRESS AND MITOCHONDRIAL DYSFUNCTION

The etiology of AMD is heavily influenced by mitochondrial dysfunction and oxidative stress.[14,15] Damage to the retina results from malfunctioning mitochondria in retinal pigment epithelium (RPE) cells, which also cause oxidative stress and inflammation. Reactive oxygen species, mt-DNA damage, protein aggregation, and inflammation in AMD are all associated with mitochondrial dysfunction.

MACULAR PIGMENT OPTICAL DENSITY

According to the study, people with first-degree relatives who have AMD tend to have lower macular pigment optical density values, which may be a sign that AMD will occur in the future.[16] This shows that macular pigment optical density might be useful for determining risk.

ROLE OF ANTIOXIDANTS AND SMOKING

Carotenoids and antioxidant vitamins like lutein and zeaxanthin protect the retina from oxidative damage.[17] According to epidemiological evidence, smoking and low plasma concentrations of these substances are both linked to an increased risk of AMD. Antioxidants assist in reducing the effects of light absorption.

Medications that block vascular endothelial growth factor (VEGF) can be used to treat wet AMD.[1] In addition, the treatment of AMD may be improved by next-generation drugs and therapies using induced pluripotent stem cells (iPSCs). Eye-related disorders may benefit from therapeutic approaches that target mitochondrial dysfunction, such as -lipoyl- L-carnitine. A significant threat to eyesight as people age is AMD, a complex eye illness that affects millions of people worldwide. Numerous research has examined different facets of AMD in recent years, illuminating preventative methods, risk factors, hereditary impacts, and potential treatment modalities (Table 1). A more thorough picture of AMD has been developed by combining the results of various investigations, providing useful information for both patients and medical practitioners. The importance of nutrition in preventing AMD has been one of the main areas of study. In their study underlined the potential of vitamins and minerals like zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids in lowering the risk of growing early AMD.[5] Research on AMD has also given a lot of attention to genetic variables. The complex interplay between hereditary polymorphisms and environmental factors in AMD development was emphasized by Stradiotto

TABLE 1: Recent studies on the prevention of hereditary transmission in senile macular degeneration.

Sources	Aim	Method	Findings	Interpretation
Di Carlo and Augustin[5]	To give a thorough overview of what is currently known about preventative measures for AMD.	To ascertain the relationships between (dietary risk factors, way of life, and light exposure) these variables and the likelihood of developing AMD, the process entails assessing study results.	The analysis emphasizes several nutrients that have demonstrated potential to lower the risk of developing early AMD, including zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids.	Protecting the eyes from excessive light exposure could help prevent AMD, given the potential role of UV rays and blue light in retinal damage.
Sayin and Altinkaynak[16]	To assess the macular pigment optical density and contrast it with a healthy control group in first-degree relatives of patients with AMD.	The study (Group 1) included 138 healthy participants who were first-degree relatives of patients with AMD. 74 healthy individuals served as the study's control group (Group 2).	First-degree relatives of patients with AMD had considerably lower macular pigment optical density values than the control group.	In first-degree relatives of AMD patients, macular pigment optical density may serve as a marker for the future development of AMD.
Stradiotto et al.[13]	To examine the intricate nature of AMD, a condition that is influenced by both genetic and environmental factors.	The method entails a rigorous synthesis of the body of knowledge on genetic polymorphisms, treatment strategies, and AMD.	The review emphasizes how complicated and multifaceted AMD has consistently been linked to genetic variants, highlighting the important role that genetics plays in how diseases evolve.	Although there is a strong genetic link to AMD, the utility of genetic tests and polygenic scores in determining the best course of treatment has not been shown.
Moos et al.[15]	To learn more about the relationship between mitochondrial malfunction and different degenerative diseases, especially those that affect the nervous system and age-related chronic illnesses, such as hereditary disorders.	The study collects and synthesizes existing information on the relationship between mitochondrial dysfunction and degenerative diseases using a literature review methodology.	The study emphasizes the therapeutic potential of -lipoyl-L-carnitine for conditions connected to vision.	Overall, the study's findings highlight the possible therapeutic avenue that can help people who suffer from vision loss and related eye ailments.
Deng et al.[1]	To fully address AMD as a complex eye illness.	The study uses a review-based methodology and synthesis of prior research to offer a comprehensive picture of AMD.	Wet AMD can be successfully treated with anti-VEGF medication. New generation medications and RPE cell therapy made from induced pluripotent stem cells have promise for improving AMD treatment.	It is mentioned how important anti-VEGF medication is for treating wet AMD.
Snodderly[17]	To examine the interaction between antioxidant vitamins, smoking, and AMD and how they affect each other.	Using both epidemiological and laboratory data, the study takes a multidimensional approach. Low plasma concentrations of carotenoids, antioxidant vitamins, and smoking are linked to an increased risk of AMD using epidemiological data.	The study suggests that a combination of smoking and low plasma concentrations of carotenoids and antioxidant vitamins increases the risk of AMD.	The study emphasizes how carotenoids and antioxidant vitamins protect the retina from oxidative damage, with an emphasis on how they can lessen the consequences of light absorption.
Rondanelli et al.[12]	To assess the most recent findings on dietary strategies for avoiding and supporting the treatment of three common eye conditions: cataracts, AMD, and DR.	A thorough methodology is used in the review, which incorporates the most recent data from studies on diet, nutrition, and eye disorders. The study assesses how well certain foods can be used to cure or prevent DR, AMD, and cataracts.	The review provides dietary guidance for DR, AMD, and cataract prevention or support. The recommended food pyramid stresses weekly eating of fish, white meat, legumes, eggs, and some dairy products in addition to daily consumption of low glycemic index grains, fruits, vegetables, extra virgin olive oil, nuts, and oil seeds.	The study creates a useful dietary pyramid that people at risk of various eye illnesses can use by combining previous research findings. The pyramid places a strong emphasis on eating nutrient-rich meals that can help prevent eye disorders.
Mrowicka et al.[11]	To summarize the current understanding of lutein and zeaxanthin's function in human health, with an emphasis on their bioavailability, metabolism, and importance in preventing and treating eye conditions such AMD and cataracts.	The methodology of the article discusses and summarizes previous clinical studies, research studies, and literature about lutein and zeaxanthin.	Zeaxanthin and lutein are structurally related carotenoids that are both members of the xanthophyll family. They can be found in a variety of foods, such as certain fruits, dark green vegetables, and egg yolks.	According to the article's interpretation, these results show how important lutein and zeaxanthin are for preserving eye health and preventing eye disorders. According to the research, eating a diet high in xanthophyll-containing foods, like dark leafy vegetables and select fruits, can raise the body's levels of lutein and zeaxanthin, and so promote overall health, especially regarding eye health.
Kaarniranta et al.[14]	To discuss about how mitochondria affect AMD and the aging of the RPE.	The methodology of the article includes Studies on cells, animal models, and maybe clinical information that shed light on the role of mitochondrial dysfunction in AMD pathophysiology fall under this category.	An important contributing element to the onset of AMD is RPE damage brought on by oxidative stress. ROS, which cause oxidative stress and cellular damage, are crucially produced by mitochondria.	According to the article's interpretation of these results, there is a direct correlation between AMD development and mitochondrial failure, oxidative stress, and inflammation. Several important factors in AMD pathophysiology, including the formation of ROS, mt-DNA damage, protein aggregation, and inflammation, are influenced by dysfunctional mitochondria in RPE cells.

AMD: Age-related macular degeneration; VEGF: Vascular endothelial growth factor; DR: Diabetic retinopathy; RPE: Retinal pigment epithelium; ROS: Reactive oxygen species.

et al. paper.[14] Although genetics have a significant impact, it is still difficult to translate gene-transmitted discoveries into effective treatment plans. This underlines the requirement for ongoing study is related to a family case condition and tailored medicine gaps for AMD. It has been revealed the importance of mitochondrial dysfunction in the pathophysiology of AMD. Oxidative stress, inflammation, and retinal injury are all caused by malfunctioning mitochondria in retinal pigment epithelial cells. This new knowledge opens the door to prospective therapeutic approaches, such as focusing on mitochondrial health to slow the progression of AMD.

Collectively, these findings underline the complex nature of AMD and emphasize how crucial it is to comprehend elements like heredity, dietary choices, antioxidant consumption, and mitochondrial health to prevent and treat this disorder that can result in vision loss.

Treatment-wise, the study emphasized the effectiveness of anti-VEGF therapy in managing wet AMD, giving those who are affected hope.[1] Meanwhile, there are promising possibilities for improving AMD treatment outcomes thanks to the promise of new-generation drugs and iPSC-based therapies.

In conclusion, new studies have shown the complex structure of AMD and shed light on prospective preventative and therapeutic approaches. The parts of the AMD puzzle are starting to fit together, from dietary recommendations and genetic discoveries to mitochondrial health and antioxidant defense. As a result of the combined knowledge gained from this research into AMD, the field of vision care has the potential to change, opening the door to earlier detection and more potent treatments for this common eye condition.

DISCUSSION

The thorough analysis of recent research publications on preventing hereditary transmission in senile macular degeneration provides insightful information on the intricate interactions between genetics, environmental variables, and therapeutic options. The main conclusions, ramifications, and study limitations will be highlighted in this debate. The research emphasizes the significance of genetics in the development of AMD, highlighting that hereditary variants have a crucial influence. However, due to the disease's complexity, environmental factors like oxidative stress, mitochondrial malfunction, and dietary practices also play a role. This emphasizes the demand for a comprehensive strategy for both prevention and treatment. According to the study, certain nutrients, such as zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids, protect against oxidative damage. A few minerals, such as zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids, may help lower the risk of appearing early AMD. The protective effects of antioxidants like lutein and zeaxanthin against oxidative damage highlight the need of a balanced diet in preserving eye health. Lower macular pigment optical density readings among first-degree relatives of AMD patients raise the possibility that this measurement could be used as a predictor of the progression of AMD. This discovery might result in risk assessment and action starting earlier. Underscoring the intricacy of this disabling condition is the complicated interplay between genetics, environmental variables, and treatment approaches in preventing hereditary transmission of senile macular degeneration (AMD). Key findings from recent studies have illuminated the complexity of AMD, which has several facets. The genesis of AMD is heavily influenced by heredity, with the impact of gene-transmitted variations taking center stage. These variations have a significant influence on the development and susceptibility of disease. The complexity of AMD, however, makes it necessary to include environmental components in the story. The complex etiology of AMD is woven together by oxidative stress, abnormal mitochondrial function, and dietary choices. A holistic approach that includes both preventative measures and therapeutic interventions is urgently needed given this complexity. The research in this area emphasizes the value of minerals, including zinc, beta carotene, lutein, zeaxanthin, and omega-3 fatty acids. These substances display a defense against oxidative harm, offering a potentially adjustable risk reduction strategy. We learn how to improve retinal health and prevent early AMD by utilizing antioxidants and minerals. The in-

vestigation's findings regarding the measurements of macular pigment optical density reveal a brand-new dimension. The reduced measures seen in first-degree relatives of AMD patients open up a new field for risk analysis. The study emphasizes the importance of mitochondrial dysfunction and oxidative stress in the etiology of AMD. These elements contribute to retinal inflammation and damage, highlighting possible treatment approaches to mitochondrial health. Anti-VEGF medication has emerged as a promising treatment for wet AMD, while new-generation medications and iPSC-based therapies hold potential for improving treatment outcomes. This points toward evolving treatment strategies for managing AMD effectively.

LIMITATIONS AND FUTURE RESEARCH

While the study provides valuable insights, it is important to acknowledge its limitations. The study's focus on recent research publications from 2019 to 2023 might exclude relevant older studies that could contribute to a more comprehensive understanding of AMD prevention. Excluding non-English studies could result in missing out on valuable research findings published in languages other than English. The study's reliance on published research might introduce publication bias, as negative or inconclusive results are less likely to be published. The study focuses on research conducted primarily in Türkiye, which might limit the generalizability of findings to other populations with different genetic, environmental, and lifestyle factors The report provides new directions for further investigation into AMD prevention and treatment: Studies following people's eye health over time over a long period of time, or longitudinally, may shed more light on the connections between genetics, the environment, and the development of AMD. By conducting intervention trials in accordance with the study's findings, it may be possible to demonstrate empirically the efficacy of dietary changes, antioxidant supplements, and mitochondrial-targeted treatments. Examining the viability and efficacy of gene-transmitted counseling for people with a family history of AMD may be able to aid with risk assessment and specialized preventative plans.

CONCLUSION

The evaluation of recent research articles in the study provides important insights into how to stop the hereditary transmission of senile macular degeneration. The results add to a more complex understanding of AMD and its management, from heredity and environmental variables to nutrition, antioxidants, and pharmaceutical options. Although there are several limitations to the study, its implications for tailored approaches, early identification, and therapeutic innovation have the potential to influence future prevention and treatment that comes close to AMD.

RESEARCH IMPLICATIONS

The study's conclusions have significant ramifications for both academics and medical professionals working in the field of eye health:

Individualized preventive and Treatment Approaches: Understanding the familial and environmental factors that affect AMD helps direct individualized preventive and treatment approaches. A person's risk profile could be considered while designing genetic tests, dietary changes, and lifestyle changes.

Early Detection: Macular pigment optical density may be a useful early indicator of the chance of developing AMD, enabling earlier treatment and more intensive monitoring in people with a family history of the condition.

Therapeutic Innovation: The focus on oxidative stress and mitochondrial health as crucial elements in AMD progression may prompt the development of novel therapeutic approaches that specifically target these elements.

Patient education: Teaching patients on how their diet, antioxidant intake, and lifestyle decisions affect their eye health could empower them to take proactive measures to prevent AMD.

Interdisciplinary strategy: Collaboration among geneticists, ophthalmologists, dietitians, and other experts may help us better comprehend the complex nature of AMD.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct con-

nection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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