

Age-related macular degeneration

The case for early screening

Age-related macular degeneration (AMD) is a leading international cause of irreversible blindness and visual impairment. It is predicted that 196 million people globally will suffer from AMD by 2020, increasing to 288 million by 2040.

It is also, to some extent, misleadingly named. While age is clearly a key factor in developing AMD, other factors both within and beyond a person's control play significant roles in the prevention or management of the condition.

Firstly, this paper will examine the role of non-modifiable risk factors in the development of AMD, including:

- family history
- ethnic background
- gender

Secondly, it will highlight a number of modifiable lifestyle factors linked to AMD and consider how eye-care professionals can advise patients on managing these. AMD's modifiable risk factors include:

- low macular pigment optical density (MPOD)
- smoking
- diet
- high body mass index (BMI)

Thirdly, it will assess the academic case for increasing the screening of AMD as well as considering programs of ongoing monitoring intended to mitigate AMD risk or to slow the progression from dry AMD to the more aggressive and debilitating 'wet' form of the condition.

Lastly, it will investigate the correlation between the effectiveness of lutein and zeaxanthin (L/Z) supplementation and regular patient monitoring.



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Non-modifiable risk factors of AMD

Age is a key factor in developing AMD. Statistical data compiled by the US National Eye Institute (NEI) in 2010 gives some interesting insights into the other non-modifiable risk factors at play.

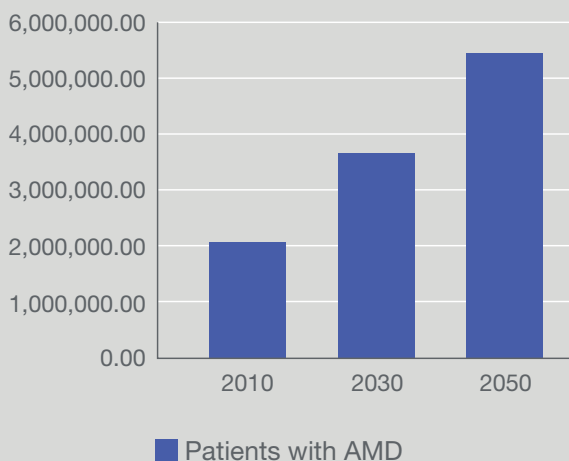
Ethnic background is one of these factors. The NEI data, for example, showed that approximately 3% of White (non-Hispanic) Americans between the age of 50 and 80 years old developed AMD compared with just over 1% of subjects of Black and Hispanic background in the same age groups.

Across all ethnic groups, susceptibility almost doubles for those over 60, compared with those in their 50s, while those over 80 are more than 30 times more likely to develop the



Predicted rise in AMD cases in the USA

NEI DATA

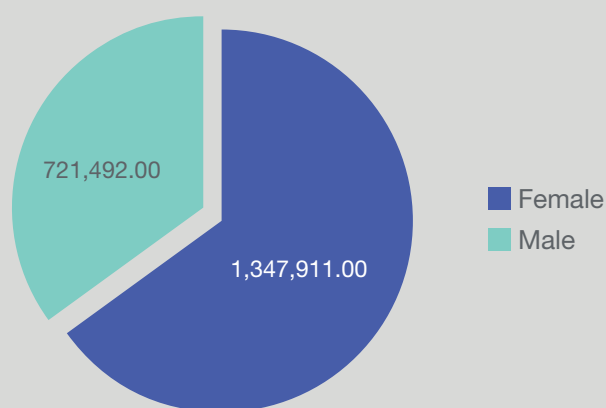


condition than those in their 50s. This may sound stark, but as this whitepaper will indicate, there are ways to mitigate the threat and impact of AMD if early action is taken.

Another study conducted in 2010 showed the number of Asians aged between 40 and 79 developing AMD was comparable to Whites in the same age range but the early signs of AMD were less common amongst the Asians. More research is needed into the links between AMD prevalence and ethnic background.

An ageing global population is set to strain the resources allocated to combating the condition. For example, the NEI projected the 2,069,403 cases of AMD among Americans in 2010 will rise to 3,664,044 in 2030 and 5,442,265 by 2050. Of these, over 4.5 million will be White compared to just over 247,000 Black and 446,000 Hispanic.

AMD cases by gender



A 2012 study by Shahid et al, published in the British Journal of Ophthalmology, concluded that a person's risk of developing AMD is increased significantly by having a first-degree relative with the condition. For those with an affected sibling, this increase was 12-fold, possibly higher for those with an affected parent.

Gender is another branch of the genetic link with AMD. According to Prevent Blindness America, the discrepancy between male and female patients is pronounced. They report 1,347,911 female patients (across all ages and races), compared to only 721,492 males.

While age, gender and family history are beyond the control of individuals, there does seem to be a clear case emerging for the regular screening of those most at risk from AMD.

Lifestyle factors affecting AMD

According to a paper from Beatty et al (1999), in the British Journal of Ophthalmology, while the specifics behind the cause and development of AMD are still debated, the role of oxidative damage to the macula is widely accepted as significant.

Macular pigment (MP), with its antioxidant properties and absorption of harmful blue light, is widely seen as a protective barrier within the eye. A number of lifestyle factors contribute to a person's level of MP.

In line with genetic factors and an aging population, the level at which we come into contact with blue light is raised dramatically compared to previous generations. The significant global rise of smartphones, along with increased time spent looking at all variety of other blue light-emitting screens, means that our exposure to blue light is now far higher, while the lifestyle factors which might mitigate its effects have changed very little.



Smoking's worrying résumé of adverse health effects includes lowering the level of carotenoids, such as lutein and zeaxanthin (L/Z), in the blood. With MP being composed chiefly of L/Z, studies have shown an inverse relationship between the frequency of smoking and the density of the MP.

Furthermore, research by Khan et al (2006) demonstrated that passive smoking is associated with an increased risk of AMD, spread equally across both genders. These findings can

be read alongside those published by M.W. Swanson (2014) whose research indicated a higher level of those with AMD not reporting that they were smokers, compared to the general population.

It could perhaps be inferred that AMD patients are less likely to report themselves as smokers in instances where the link between smoking and a given disease is less obvious than, for example, lung conditions. Thus it falls to eye-care professionals to educate their patients on the far-reaching ill effects of smoking and the evidence linking smoking to an increased risk of AMD.

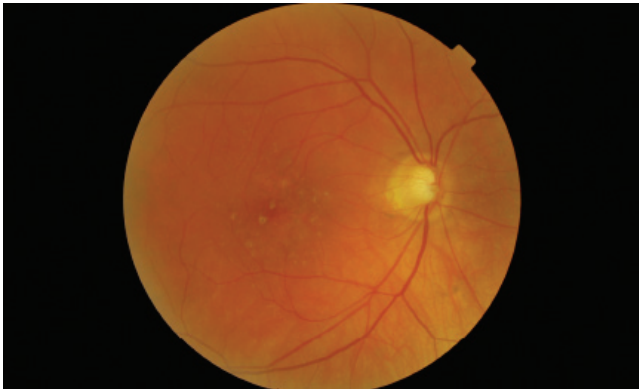
A person's physical fitness can also be a factor in their risk of developing AMD. A longitudinal study begun in 1988 by Knudston et al followed 3874 people aged between 43 and 86 over a 15-year period. Over this time, it drew a significant link between an active lifestyle and a lower risk of developing the condition.

It stands to reason that the benefits of regular exercise on cardiovascular health would extend to the entirety of the body's blood flow. What may be less immediately apparent is the relationship between obesity and AMD.

A study by Peeters et al (2008) published in the Archives of Ophthalmology examined the fluctuation of patients' waist-hip ratio (WHR) and their development of AMD. Those examined, aged between 45 and 64, were followed up after six years.

Using WHR to measure abdominal obesity, it was observed that a drop of 3% or greater equated to a 29% lower prevalence of any kind of AMD. It is interesting to note that for those who were classed as obese, any drop in WHR was met with a noticeably larger drop in AMD risk. For them, the risk was 59% lower.

As with smoking, the link between AMD and the vascular system may not be apparent to many patients. While exercise and a healthy BMI are always things to be encouraged, those groups identified as most at risk of developing AMD would particularly benefit from knowing more about the vascular system's relationship to healthy eyes.



Wet vs dry AMD

Of all reported cases of AMD, 90% are the atrophic or 'dry' variety. In dry AMD, yellow drusen deposits form in the retina, the build-up of which causes vision impairment in the early stages. Only in advanced dry AMD is there evidence of the degeneration of the macula itself, leading to the central vision loss most commonly associated with the disease.

If not addressed as mentioned above, AMD can progress to the more debilitating 'wet' variety, where abnormal blood vessels leak fluid directly into the macula. Although less than 10% of AMD cases are of this type, wet AMD accounts for the overwhelming majority of severe vision loss arising from the disease. It is not only far more life-limiting than dry AMD, it also progresses far faster.

Treatment for wet AMD can be highly invasive and costly. Anti-VEGF medications such as Ranibizumab or Aflibercept both involve monthly injections directly into the eye to halt the formation of blood vessels in the macula.

One surgical option is photodynamic therapy (PDT) where light-sensitive Verteporfin is injected into the arm and attaches to the abnormal blood vessels in the eye. A laser is then shone into the eye, activating the drug and causing it to destroy the abnormalities in the macula.

Another alternative is laser photocoagulation, where a laser is used to cauterise parts of the retina, preventing the formation and development of abnormal blood vessels in the macula. However, according to the NHS, just one in seven AMD patients are eligible for this treatment as it involves surgery close to the delicate fovea. It also results in a mild loss of vision, to be weighed against the possible vision loss from AMD itself.



The importance of screening

Given the number of cases predicted among an aging population and the relative difficulty of treating wet AMD, it falls to eye-care professionals now to promote early screening and educate patients.

Specialised, portable equipment like the MPS II allows eye-care professionals to engage on- and off-site with those people in high-risk brackets within their communities. This method will allow AMD risk to be determined early, mitigating its long-term impact.

There is also a strong business case for detecting AMD as early as possible before the cost of treating advanced cases among a larger population becomes prohibitive. Early-stage dry AMD can be managed by working with patients to promote a healthy lifestyle in line with the above advice.

Where applicable, eye-care professionals may also recommend supplements as a viable method of combating early AMD. The efficacy of supplementation as a method for managing dry AMD has been accepted since the results of the AREDS and AREDS2 longitudinal research studies. These have shown that L/Z supplementation can reduce the risk of developing advanced AMD by 25-30%. Nutritional supplements are rich in anti-oxidants such as lutein and zeaxanthin and are an effective way to boost macular pigment, in conjunction with a programme of regular monitoring using the MPS II.

Screening therefore plays an important role in a complementary three-step process, beneficial to those at risk of AMD now and in future generations:

Step 1: Engagement and detection of high-risk prospective AMD sufferers

Step 2: Education on modifiable risk factors, including supplementation

Step 3: Ongoing macular pigment screening to monitor risk levels

What can eye-care professionals do?

Eye-care professionals with community-based practices in the UK and across the world can adopt macular pigment screening at a local level to help combat the global threat of AMD. The model is one that will benefit both patients and practitioners. MP screening will identify those with or at risk of AMD and enable them to be educated early on the modifiable risk factors that have been proven to mitigate the longer term effects of the condition.

A key step, therefore, is to actively raise awareness of the threat of AMD amongst local communities. In this, eye-care professionals are aided by a number of different awareness initiatives throughout the year, around which their efforts can be based. The American Academy of Ophthalmology (AAO), for example, has AMD Awareness Month during February each year; the UK-based Macular Society runs Macular Week each June with National Eye Health Week also taking place in the UK in late September; the International Agency for the Prevention of Blindness (IAPB) runs World Sight Day in October, too. These are just a handful of examples from which inspiration can be drawn for programmes of local awareness raising.

By working together with colleagues, professional bodies and sight loss charities, it becomes easier to use opportunities like these events to highlight the key issues surrounding AMD, its threat and the ways to mitigate them in future. Sharing resources and time might not be practical all year-round, but in order to make sure a message promoting the importance of early screening begins to reach the right people, working cooperatively to raise awareness will have the most positive impact.



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