

Lily Jones

Speice 3A

Independent Study and Mentorship

6 September, 2018

Diabetes and Eye Vision Decisions

Assessment 2- Research

Date: September 6, 2018

Subject: Diabetes in relation to eyesight

Works Cited:

Mashidas, David. "HOW DIABETES affects your patients: Number of patients with diabetes is increasing; know how to manage them." *Optometry Times*, June 2018, p. 1+.

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Assessment:

This week's research in ISM was extremely informative and reassuring. When searching through multiple databases, I found numerous articles about various diseases found in the eyes. These pieces of text were geared more toward ophthalmologist professionals and their responsibilities in surgery, rather than the role that an optometrist would have. From this, I had to ensure that the articles I found only described the role that an optometrist would take in certain situations. Throughout the week I wrestled and skimmed

over different texts, and eventually came across an article explaining the effects of Diabetes Mellitus (DM) on eyesight, from an optometrist's standpoint.

Working through *How diabetes affects your patients: Number of patients with diabetes is increasing; know how to manage them*, forced me to search terms and spend additional research time to look up background information on specific ocular vocabulary that I was not necessarily familiar with. This was a realization of growth during my research process, because I was able to recognize and make connections with some of the previous vocabulary from my last article I read. This also was more of a personal benefit for me, since I decided to put aside the extra time to find the definition of the terminology.

An interesting process that I learned while annotating this article was the generic way optometrists detect Nonproliferative Diabetic Retinopathy (NPDR) in their diabetic patients. The "4: 2: 1 Rule" is especially used to determine NPDR's severity in each quadrant of the eye. Additionally, this article briefly touched on the basics of Diabetes Mellitus (DM). Not only does T2DM cause mobility complications, but also results in worsening eyesight. These statistics are alarming, considering these problems are detrimental to the overall health of people.

This information is personal and important to me, considering my mom is diagnosed with Type 1 Diabetes. After researching this week, I found that Diabetes Mellitus does change the eyesight of those affected. This information is vital to the future, considering that "...366 million people are estimated to have diabetes mellitus by 2030...". For the optometry field, these predictions are promising, considering diabetes is correlated with ocular diseases. Looking into the future, this information is extremely applicable to me and my aspirations.

When I finish my undergraduate and doctorate schooling, this field should be accessible, since obesity and the optometry field itself are growing rapidly across the world. This information proves that optometrists are needed in society, and require a physical person to diagnose and accompany with his/her patients' issues. From my perspective, this knowledge helps me recognize that although technology is becoming more advanced daily, optometrists will still be needed in the future.

From this point forward, I am planning to study the way corrective lenses are prescribed, and possibly along with how age weakens one's eyes. Also, after exploring my first research assessment, I may want to consider annotating and finding more than one article next week. This would be essential for me because there is a plethora amount of information to learn about optometry, diseases, and including corrective lenses. I am thrilled to continue to push through this course and absorb as much information as I can.

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HOW DIABETES affects your patients: Number of patients with diabetes is increasing; know how to manage them

David Mashidas

Optometry Times. 10.6 (June 2018): p1+.

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<http://optometrytimes.modernmedicine.com/optometrytimes/issue/issueList.jsp?id=2502>

Full Text:

The destructive effects of diabetes mellitus (DM) are far reaching, and optometrists see patients with diabetes in their chairs every day. Ocular effects of diabetes include changing vision, dryness, diabetic retinopathy, diabetic macular edema, cataracts and glaucoma. Vision changes may include reduction in visual acuity, refractive error, color vision and accommodative dysfunction. Dryness is usually the end result of a neurotrophic cornea in addition to sluggish glands leading to tear deficiency.

Diabetic retinopathy

Diabetic retinopathy (DR) is a disease of the retina caused by diabetes that involves damage to tiny blood vessels in the back of the eye. Diabetic retinopathy afflicts 93 million people worldwide, and 28 million of these have vision-threatening DR. (1-3) These numbers are expected to increase as the prevalence of type 2 diabetes (T2DM) continues to climb. (4)

DR is a major cause of blindness in the United States. (5) Diagnosis and treatment of DR focus on vascular abnormalities that appear at later stages of the disease.

DR is diagnosed in five stages.

The first stage is "no apparent retinopathy." As the name implies, there are no diabetic fundus changes.

The second stage is "mild nonproliferative retinopathy" (NPDR). This stage is characterized by the presence of a few microaneurysms.

The third stage is "moderate NPDR," which is characterized by the presence of microaneurysms, intraretinal hemorrhages, or venous beading (VB) that do not reach the severity of the standard diabetes photographs 2B, 6A and 8A.

The fourth stage--severe NPDR--is the key level to identify. Data from the Early Treatment Diabetic Retinopathy Study (ETDRS) has shown that eyes in patients with T2DM that reach severe NPDR have a 50 percent chance of developing high risk characteristics if laser treatment is not instituted. (6)

laser treatment
consultants → some optometrists

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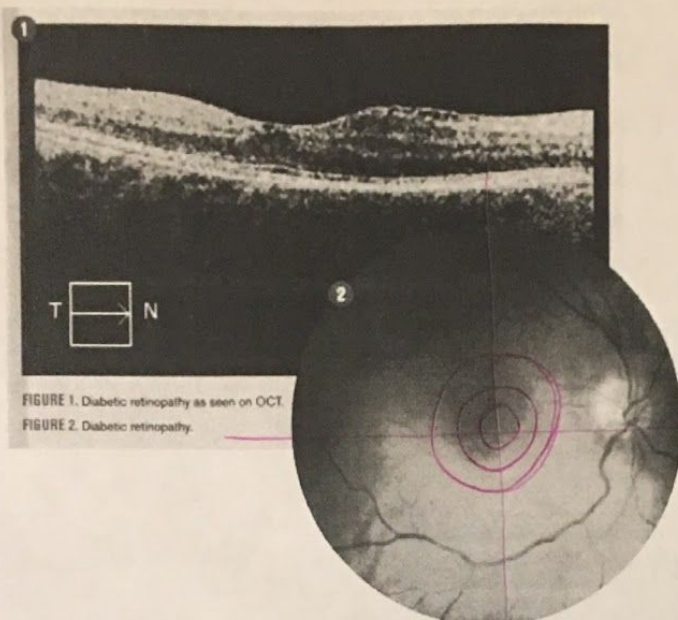


FIGURE 1. Diabetic retinopathy as seen on OCT.

FIGURE 2. Diabetic retinopathy.

Addressing and diagnosing NPDR in quadrant

The diagnosis of severe NPDR is based on the 4:2:1 rule of the ETDRS. (7) Using standard diabetes photographs 2B, 6A and 8A to compare with fundus findings, optometrists can easily diagnose severe NPDR. (7)

regions rule to identify NPDR presence

4:2:1 rule

If hemorrhages of at least the magnitude of standard diabetes photograph 2B are present in all four quadrants, then by definition severe NPDR is present. If two or more quadrants have venous beading (VB) of the same magnitude or greater than standard photograph 6A, then by definition severe NPDR is present. If one or more quadrants has intraretinal microvascular abnormalities (IRMA) of the same magnitude or greater than standard diabetes photograph 8A, then by definition severe NPDR is present.

The final stage is "proliferative diabetic retinopathy" (PDR). PDR is characterized by neovascularization of the disc, neovascularization of the retina, neovascularization of the iris, neovascularization of the angle, vitreous hemorrhage or fractional retinal detachment.

Diabetic macular edema

fluid collection due to leaking blood vessels

Diabetic macular edema (DME), defined as a retinal thickening involving or approaching the center of the macula, represents the most common cause of vision loss in patients affected by DM. (8) DME results when fluid accumulation increases retinal thickness and causes light-distorting fluid-filled cysts within retinal tissue and serous detachments separating the neural retina from the underlying pigmented epithelium. (9)

The ETDRS defined clinically significant diabetic macular edema as edema satisfying any one of the following three criteria: (10)

- Any retinal thickening within 500 [micro]m of the center of the macula
- Hard exudates within 500 [micro]m of the center of the macula with adjacent retinal thickening
- Retinal thickening at least one disc area in size, any part of which is within 1 disc diameter of the center of the macula.

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When present, DME was subclassified into mild, moderate, or severe depending on distance of the thickening and exudates from the fovea."

DME treatment may be evolving from a laser ablative approach into a pharmacotherapeutic approach. The exponential growth that has occurred over the past decade in the retinal pharmacotherapy field has led to the development of several pharmacotherapies for retinal vascular diseases including DME, such as pegaptanib (Macugen, Bausch + Lomb), bevacizumab (Avastin, Genentech), ranibizumab (Lucentis, Genentech), and aflibercept (Eylea, Regeneron).

Many of these agents, in the form of intravitreal injections or sustained delivery devices, have already undergone clinical trial testing for safety and efficacy and others, such as avacincaptad (Zimura, Ophthotech) are currently being evaluated.

Gestational diabetes

Gestational diabetes is a type of diabetes that is first seen in a pregnant woman who did not have diabetes before she was pregnant. Gestational diabetes usually manifests itself in the middle of a pregnancy. Doctors test for it between 24 and 28 weeks of pregnancy.



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Women who have had gestational diabetes have a 35 percent to 60 percent chance of developing T2DM in the next 10 to 20 years.

Updated criteria for diagnosing gestational diabetes will increase the proportion of women diagnosed with gestational diabetes. Using these criteria, an international, multicenter study of gestational diabetes found that 18 percent of the pregnancies were affected by gestational diabetes. (12)

Gestational diabetes may be an independent risk factor for cataracts later in life, although the risks are greatest for women who subsequently develop T2DM.

Cataracts

The number of people with DM is increasing, (13) and cataracts are one of the most common causes of visual impairment in these patients. (14)

The incidence of cataracts in insulin-dependent, non-insulin-treated, and insulin-treated non-insulin-dependent diabetics were 7.1, 11.7, and 17.8 per 1000 person-years, respectively. Cataract was four times more common in diabetics and twice more frequent in men. (15)

DM

↳ diabetes mellitus

↳ type 1: insulin - not enough produced

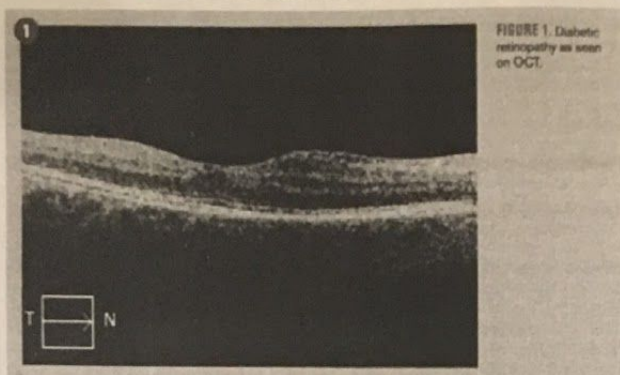
↳ type 2: more common - ~~overweight~~ overweight individuals

cataracts
vision
↳ subcapsular
↳ nuclear
↳ cortical

breaking news → cataracts increasing in DM patients

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It was found that the risks for cortical cataracts (CC) and posterior subcapsular cataracts (PSC) were elevated for patients with T2DM. (14) *cataracts more prevalent in T2DM*

Advances in cataract surgical techniques and instrumentation have improved outcomes; however, surgery may not be safe and effective in certain individuals with pre-existing retinal pathology or limited visual potential, according to the Wisconsin Epidemiologic Study of Diabetic Retinopathy. (16)

Glaucoma \Rightarrow Types:
 ① open-angle ④ congenital ⑤ pseudoxfoliative ⑥ ICE
 ② angle-closure ⑥ secondary ⑦ traumatic ⑧ uveitis
 ③ normal-tension ⑧ pigmentary ⑨ neovascular etc...

The relationship between diabetes and open-angle glaucoma (the most common type of glaucoma), has intrigued researchers for years. People with diabetes are twice as likely to develop glaucoma as are non-diabetics, although current research is beginning to call this into question. (17)

Neovascular glaucoma, a rare type of glaucoma, is always associated with other abnormalities, diabetes being the most common. Neovascular glaucoma can occur if these new blood vessels grow on the iris close off the fluid flow in the eye and raise intraocular pressure (IOP). (17)

Dry eye

Patients with DM have an increased risk of dry eye. The diabetic patient has decreased tear break-up time, Schirmer's test values, and corneal sensitivity as well as increased fluorescein and lissamine green staining. (18,19)

In diabetes, damage to the microvasculature feeding the lacrimal gland together with autonomic neuropathy of the lacrimal gland--both of which occur early in the course of diabetes--may contribute to impaired function of the gland. (20)

Sorbitol accumulation within cells can lead to cellular edema and dysfunction, which causes lacrimal gland damage and dysfunction and decreased tear secretion. (21)

Decreased corneal sensitivity is a clinical manifestation of diabetic keratopathy. Furthermore, reduced corneal sensation can also lead to a reduced blink rate and increased tear evaporation. (22) These potential mechanisms induce DED in diabetic patients.

Diabetes and eye care

A comprehensive eye examination by an optometrist or ophthalmologist annually or biannually at minimum to identify changes in the blood vessels of the retina is recommended for persons with diabetes. (8)

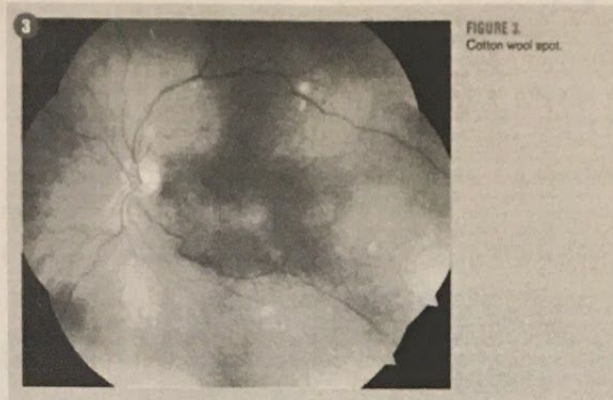
The number of patients with DM is increasing, and the need for proper diabetic eyecare will only escalate in the future. This situation presents an opportunity for optometrists to serve as primary

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eyecare providers for these patients. Optometrists need to be proactive in keeping up with new technology and treatment so they can serve these patients with the most un-to-date options.

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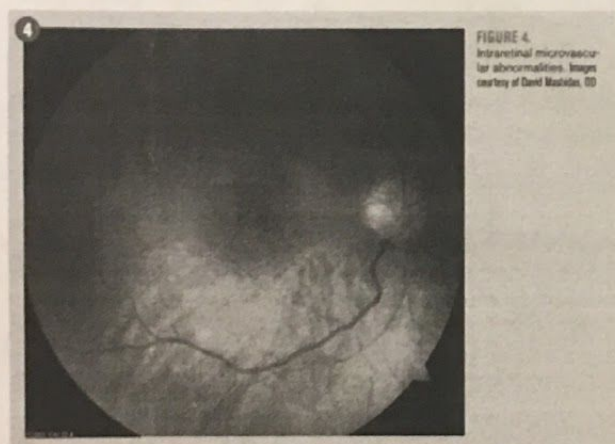
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By David Mashidas, OD

Dr. Mashidas practices medical eye care and launched the Diabetic Eye Center in Utah in 2000. He spends time golfing, enjoys photography, and likes to tinker with cars.

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35-65% Chance of women who have had gestational diabetes developing T2DM in the next 10 to 20 years

TAKE-HOME MESSAGE More than 9 percent of U.S. adults have diabetes, and those patients are sitting in your chair. From diabetic retinopathy to macular edema to cataracts and glaucoma, this systemic condition has far-reaching effects. Learn the ocular effects of diabetes and how to best help your diabetic patients.

By the numbers

Globally, 347 million people have diabetes mellitus (DM) and more than 80% of diabetes deaths occur in low and middle income countries. (1) Around 366 million people are estimated to have diabetes mellitus by 2030 and the increase in adult diabetes is estimated to be far more (69 percent) in developing countries than in developed countries (20 percent). (1,2) Overall, 21.7 million U.S. adults aged 18 and over (9.2 percent) have diagnosed diabetes and the percentage increases with age. (3) One in five adults aged 65 and over (20.5 percent, or 8.7 million) has diagnosed diabetes, compared with 11% (11.3 million) aged 40-64 and 1.9% (1.7 million) aged 18-39. (4)

By the numbers

Diabetes was the 7th leading cause of death in the United States in 2013 (and may be underreported). Diabetes is the leading cause of kidney failure, lower-limb amputations, and adult-onset blindness. More than 20% of health care spending is for people with diagnosed diabetes.

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The total estimated cost of diagnosed diabetes in 2012 was \$245 BILLION, including \$ 176 BILLION in direct medical costs and \$69 BILLION in decreased productivity. **people mistaking into DM and its demanding attention*

Decreased productivity includes costs associated with people being absent from work, being less productive while at work, or not being able to work at all because of diabetes. (5)

By the numbers

Diabetes mellitus is classified as type 1 diabetes (T1 DM) or type 2 (T2DM), gestational diabetes, monogenic diabetes and secondary diabetes. (6) Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes, and type 1 diabetes accounts for about 5% DM is a disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolizability of carbohydrates and elevated levels of glucose in the blood and urine. Symptoms of DM may include any of the following: frequent urination, excessive thirst, unexplained weight loss, extreme hunger, sudden vision changes, tingling or numbness in hands or feet, feeling very tired much of the time, very dry skin, sores that are slow to heal and increase susceptibility to infection. *Symptoms of DM*

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