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Diabetic Eye Diseases: A Review

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Review Article

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ABSTRACT

Diabetes is a metabolic disorder in which the body functions gets affected which may even lead to death. The systems which are affected due to Diabetes are renal system, gastro intestinal system, urinary system, circulatory system and even eye complications. Eyes are one of the important organs of the human body. Diabetes may affect eyes leading to certain diseases like Cataract, Glaucoma, Retinopathy, Myeloma and Blurred Vision. This, if left untreated may even lead to permanent blindness. Proper diagnosis and treatment is important in order to treat eye disease. A review of the eye related diseases is discussed in this article.

INTRODUCTION

Vision is most important for a man to survive and live in this world. Diabetes is a complex metabolic disorder, affecting the body metabolic functions leading to death in young age. One of the most common disorders associated with diabetes is eye complications. People with Diabetes develop a variety of eye disorders like retinopathy, glaucoma and cataract even sometimes leading to blindness. Although a number of treatments are available nowadays, people suffering with diabetes should go to regular eye checkups in order to avoid serious eye complications which may even lead to loss of vision. A glimpse of eye disorders associated with diabetes is discussed in this article for understanding the related mechanism and treatment.

DIABETES

Diabetes is a condition in which body cannot produce insulin (hormone that regulates and controls the blood glucose levels) or cannot use sufficient insulin that is produced in the body which leads to the damage of organs, blood vessels and nerves [1-2].

Diabetes also known as MadhuMeha (India) or Honey Urine is one of the diseases which was first described in Europe as “Too great emptying of the urine”. Later Greek physicians described Diabetes as “the melting down of flesh and limbs into Urine”. The term Diabetes was coined by Apollonius of Memphis (Greek) which means “to pass through”. Later Diabetes was differentiated as Type-1, Diabetes Insupidus and Type-2, Diabetes Mellitus by Indian physicians Sushruta and Charaka. Thomas Wilis added the term Mellitus to diabetes to differentiate from Insupidus [3-4].

Types of Diabetes

There are three main types of diabetes.

- Type-I Diabetes
- Type-II Diabetes
- Gestational Diabetes

Type-I Diabetes:

It is also referred as Juvenile or insulin dependent diabetes which usually develops in childhood or adolescence. In this condition, the human body removes insulin production due to the destruction of cells producing insulin by the immune system of the body due to which glucose levels get accumulated in the blood instead of using it in the form of energy [5-7].

Type-II Diabetes:

It is also referred as adult onset or non-insulin dependent diabetes. In this type of diabetes, human body cells cannot use the produced insulin in a right way (insulin resistance) which may lead to decreased production of insulin (insulin deficiency) [8].Type-II diabetes may be caused due to obesity [9-12].

Symptoms of Type-I and Type- II Diabetes:

Hunger, Fatigue, increased thirst and increased urination, slow healing sores and infections, Blurred Vision and sudden weight loss are the most common symptoms of Diabetes [13].

TREATMENT OF DIABETES

There is no treatment for the complete cure of diabetes. The goal of treatment is to lower the blood glucose levels so that we can prevent the complications caused by diabetes [14-16].

Gestational Diabetes

It occurs during pregnancy in females and often resolves after childbirth but increases the risk of diabetes in mother and child as well [17-20].

Complications Associated with Diabetes

Type-I Diabetes may affect central nervous system (Polydipsia, polyphagia, lethargy, stupor), eyes (Diabetic retinopathy, diabetic macular edema (DME), cataract, and glaucoma), Respiratory system (Hyper ventilation), Urinary system (polyuria, glysocuria), Gastrointestinal system (Nausea, Vomiting, Abdominal Pain), systemic circulation (Body weight) [21,22].

EYE COMPLICATIONS ASSOCIATED WITH DIABETES

Eye complications are common in people having high blood sugar. In order to understand what actually happens to our eye during diabetes, we should know how eye really works. Symptoms related to Diabetic Retinopathy and other Diabetes-Related Eye Problems include Fluctuating vision, Eye floaters and spots, Development of a scotoma or shadow in your field of view, Blurry and/or distorted vision, Corneal abnormalities such as slow healing of wounds due to corneal abrasions, Double vision, Eye pain, Near vision problems unrelated to presbyopia, Cataracts [23-25].

Eye Mechanism

When light passes through the outer surface of the eye, cornea and retina focusses the light on to the retina which converts the light signals in to electric signals. These electric signals are sent to the brain through the optic nerves and then the brain interprets the signals to see the objects [26,27].

Complications Associated with Eye Disease

Total 25% of the people with diabetes are having eye complications. The most common complications in people with Diabetes include [28-33]

- Blurred Vision
- Diabetic Retinopathy
- Cataract
- Glaucoma

Blurred Vision

Blurred vision is the most common complication associated with diabetes. When blood sugar levels gets increased, the lens of eye gets swollen which results in the blurred vision. It gets normal within 2-3 months after your blood sugar level gets normal.

Diabetic Retinopathy

Diabetic retinopathy can be seen in 21% of patients been diagnosed with Type-II Diabetes. It is the common cause of blindness among the working population. Retinopathy generally refers to the common disorders of retina caused due to Diabetes. As previously discussed retina of the eye converts the light signals in to electrical signals. When blood sugar levels are high, the tiny blood vessel which nourishes the retina gets blocked, cutting down the blood supply to the retina. If it is not treated on time, one may lose eye sight permanently [34-39]. Early Diabetic Retinopathy or non-proliferative diabetic retinopathy is a condition in which the tiny bulges known as microaneurysms, occur on the walls of blood vessels which may leak fluid and blood in to the retina [40-44]. Sometimes the central part of retina (Macula) begins to swell which is nothing but macular edema, which requires immediate attention. This may affect the central vision making difficult to see objects, recognizing people around. Around 2- 10% of people affected with diabetes has macular edema [45-50].

Advanced Diabetic Retinopathy or Proliferative Diabetic Retinopathy: If Diabetic Retinopathy progresses, it causes the blood vessels blocked, which results in decreased oxygen supply to retina (Ischaemia). As a nature way of repairing this condition, the eye starts growing new blood vessels in the inner surface of retina, into the vitreous gel (fluid that fills the eye), that are fragile and starts to eventually break and bleed. Due to this the vision gets unclear as the light cannot pass due to the blockage due to blood. If the hemorrhages become extensive, scar tissue grows and thickens which leads to the detachment of retina from the back of the eye, which causes permanent eye loss. Treatment includes Laser treatment, Eye injections and Eye surgery (in case of advanced retinopathy) [51-53].

Cataract

Aqueous humor is the fluid that surrounds the eye, which supplies nutrients, oxygen and glucose to eye's lens. In the case of Diabetes, when blood glucose levels are high, sugar levels increases in the aqueous humor and in the lens causing the lens to swell and unclear vision. Aldose reductase is an enzyme present in the lens, which converts glucose in to sorbitol. If blood sugar level gets increased sorbitol gets collected in the lens, which leads to opaque vision. This condition results in cataract which makes your vision blurred, yellowish, and opaque [54-59]. Treatment: Cataract operations are common in order to treat cataract replacing the clouded lens with artificial lens [58].

Glaucoma

The main cause of glaucoma is Diabetes Mellitus among people suffering with Diabetes [60-64]. There are two types of glaucoma, open angle glaucoma and neo-vascular glaucoma.

If the fluid present in the eye doesn't drain out properly from the eye, it results in increased pressure inside the eye which damages the nerves and the blood vessels causing changes in vision. Glaucoma doesn't have any symptoms until one notices peripheral loss in the vision. The risk of glaucoma is high with increasing age and diabetes. Neo Vascular Glaucoma is commonly seen in people with diabetes, in which the abnormal blood vessels grow in the inner part of the eye, blocking the fluid flow out of the eye, thus raising eye pressure [65-71]. Treatment for glaucoma includes surgery, laser treatment [73-85], eye drops and medications [86-100].

CONCLUSION

Diabetes is the most common metabolic disorders when body's ability to metabolize carbohydrates to energy fails, which lead to increase in the blood sugar levels due to which various disorders which may be nervous, eye related, cardiovascular etc. may develop. If not noticed in early stages it may even lead to death. Although it is not curable, several treatments came in to existence in order to maintain the blood sugar levels. This diabetes may even affect the eye, which may sometimes lead to blindness, if not noticed in the early stages. So, early diagnosis of the eye disorders is important in order to avoid serious complication of eye. People suffering with diabetes should go for regular eye checkups. Almost 40% of people with diabetes may have eye problems between 18 to 80 years of age.

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