Diabetic Eye Disease

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INTRODUCTION

Diabetic Eye Disease (DED) refers to a group of eye problems that people with diabetes may face as a complication of diabetes; these include diabetic retinopathy, cataract, ocular movement disorders, refractive change, diabetic papillopathy and anterior ischaemic optic neuropathy.[1] Some other eye diseases may be seen in diabetic patients which are not direct complications of diabetes but in which diabetes is a known risk factor like glaucoma, ocular ischaemic syndrome, retina vein occlusion, retina arteriolar emboli, retinal artery occlusion and corneal disorders; these in addition to DED make up the entity referred to as Diabetes Related Eye Diseases (DRED).[1]

Diabetic retinopathy (DR) is a chronic progressive, potentially sight-threatening disease of the retinal microvasculature, as a result of prolonged hyperglycaemia.[2,3] It remains the most severe eye complication of diabetes; is the leading cause of blindness in adults age 20-74years in USA and the United Kingdom[5]. DR rates of between

15%-42.1% have been reported among diabetes patients in hospital based studies in Nigeria.[6-10] The risk factors for diabetic retinopathy includes the severity and length of time that hyperglycaemia exists. The longer the duration of diabetes, the higher the chances of developing DR..[11] Apart from the duration of disease, the level of glycaemic control is a major risk factor with the DR rate being higher in persons with poor glycaemic control; hypertension, hyperlipidaemia, renal disease as evidenced by proteinuria and elevated urea/creatinine clearance as well as pregnancy are known risk factors for DR..[11,12,13] Prolonged hyperglycaemia induces intramural pericyte death, endothelial cell damage, increases platelet stickiness, red blood cell changes and thickening of the basement membrane in retinal vasculature. Pericyte loss leads to incompetence of the retinal vascular walls and break down of blood-retinal barrier thus increasing the permeability of the retinal blood vessels. This increased permeability is responsible for leakage of fluids and lipids giving rise to microaneurysm, retina edema and exudates; when leakage of fluid and lipid occurs in the macula, it is termed macula edema. These changes which occur in the first stage of DR are called non-proliferative diabetic retinopathy (NDPR)[14]. Endothelial cell damage, increases platelet stickiness, red blood cell changes and thickening of the basement on the other hand cause occlusion of retina vasculature with subsequent retina ischaemia, hypoxia and release of vascular endothelial growth factors (VEGF) which stimulates the growth of fragile new vessels, that is, neovascularisation on the optic disc (NVD), elsewhere on the retina (NVE) and on the Iris (Rubeosis Irides). This is the second stage called proliferative diabetic retinopathy (PDR).

Clinically, DR is asymptomatic in the early stages; later on in the disease progression blurred vision, floaters, field defects and flashes of light are possible symptoms. The presenting visual acuity as well as intraocular pressure documentation is important, however the gold standard in diagnosis and classification of DR is dilated retinal examination using binocular indirect ophthalmoscope and slit lamp biomicroscopy with the aid of high powered lenses to detect rubeosis irides, macular edema, NVD, NVE, tractional retinal detachment (TRD) and vitreous hemorrhage (VH). In the presence of opaque media, ocular ultrasonography will confirm presence of VH and TRD. Loss of vision form DR is usually secondary to macular oedema, macular ischemia, vitreous haemorrhage, tractional retinal detachment or neovascular glaucoma. Fundus photography of adequate quality can be used for screening and documentation purposes. Other relevant imaging technique providing useful information on the retinal vasculature include fundus fluorescein angiography (FFA) while optical coherence tomography (OCT) provides layered cross-sectional view of retina. The management of DR is multidisciplinary and largely preventive. The asymptomatic nature of the early and largely treatable stages screening for the disease very important. Modifiable risk factors like hypertension, hyperlipidaemia, glycaemic control and renal status must be optimised. The Action to Control Cardiovascular risk in Diabetes (ACCORD) found that intensive control of blood glucose levels with combination lipid therapy (statin and fibrate) reduced the rate of development as well as progression of DR.[15]. Intravitreal injection of VEGF inhibitors like Ranizubimad(Lucentis) with timely Grid pattern laser photocoagulation significantly improve vision in patients with diabetic macular oedema[16]. Scatter or Pan Retina Photocoagulation is the treatment of choice for PDR; VEGF inhibitors also play supportive role.

Cataract is the opacification of the crystalline lens; this leads to loss of vision due to obstruction of the light from passing and being focused on the retina. It is one of the ocular manifestations of diabetes mellitus[17]. There is additional evidence that the risk of cataract increases with increasing diabetes duration and severity of hyperglycemia.[18] 44.9% of type 2 diabetes patients had cataract; a 2.6 times higher risk than non diabetes persons in a West African Study[9], most of blindness and visual impairment in diabetes patients attending a hospital in Kano Nigeria were secondary to cataract.[19]

Pathophysiologically, chronic hyperglycaemia leads to accumulation of excess glucose in the system thus activating the Polyol pathway, that is the sorbitol-aldose reductase pathway. This allows for accumulation of sugar alcohol creating osmotic imbalance and inflow of fluid into the crystalline with resultant loss of transparency - cataract.[20] Decreased gluthathione and accumulation of Advanced Glycation End products have also been implicated in diabetes cataract. A classic diabetic cataract is rare; it presents as snowflake opacities occurring in young person with diabetes which may resolve spontaneously or progress to maturity depending on glycaemic control. More commonly, an earlier occurrence and swifter progression of age-related cataract is seen in diabetes.

Clinically, the complains are that of painless progressive blurring of vision with or without glare. The main sign in addition to a reduction in visual acuity is that of varying degrees of lens opacity. The definitive treatment for visually significant cataract is surgical extraction with implantation of intraocular lens under local anaesthesia; this may be via extracapsular cataract extraction (ECCE), small incision cataract surgery (SICS) or phacoemulsification. Cataract extraction has been implicated in progression of existing diabetic retinopathy thus the need to control existing DR preoperativey as well as intensive monitoring to ensure prompt treatment of DR postoperatively.

Ocular Motility Disorder (OMD) occurs when secondary to diabetic neuropathy involving third, fourth and sixth cranial nerves. OMD could be single or multiple; 1% of diabetes patients had OMD compared with 0.13% of control subjects in a study.[21] The underlying hyperglycaemia induced vasculopathy involves the vasa vasorum of these cranial nerves thus impairing the micro vascular supply. Third nerve palsy is usually pupil sparing because the pupillomotor fibres are located more peripherally. Clinically, the main symptoms are eye deviation of recent onset and double vision depending on the nerves involved. Thorough examination must include an attempt to exclude focal neurological deficit; OMD in DM often resolves spontaneously over a period of three to six months but orthoptic input may be required.

Refractive Change can occur in diabetes patients; it is more common in recently diagnosed diabetes patients or those with poor glycaemic control. Chronic hyperglycaemic is believed to cause an increase in influx of glucose into tissues including the crystalline lens; this increases the refractive index of the lens thus resulting in hypermetropia. Correction of previously elevated blood sugar on the other hand causes a reduction in lenticular refractive index resulting in myopia. Clinical presentation includes recently noticed difficulty in seeing far objects, reversal of presbyopia or need to change spectacles in myopia and difficulty with near vision in hypermetropia. Refraction will reveal the refractive error involved in comparison with the glycaemic level from blood sugar analysis. Treatment will involve counseling since this remains a good incentive for motivating good compliance in attempt at glyceamic control viz a viz spectacle correction.

Diabetic papillopathy is a self-limiting, sometimes bilateral disease that may affect both type 1 and type 2 diabetics. The pathogenesis remains largely unknown, but there has been evidence suggestive of its associations with a small cup/disc ratio and rapid reduction in glycaemia. It is thought to be due to vascular leakage and axonal edema in and around the optic nerve head resulting in optic disc swelling. Occasionally, it may be accompanied by intraretinal hemorrhages and hard exudates. Diabetic papillopathy tends to be mild and is usually associated with good visual prognosis; however, there are some cases in which permanent visual impairment can develop. There is no validated therapy for diabetic papillopathy; however, current case reports have shown promising results after steroid therapy[22].

Anterior Ischaemic Optic Neuropathy causes loss of vision due to damage to the optic nerve from insufficient blood supply. No clinically effective treatments exist, largely because little is known about its pathophysiology, and there are few histopathological studies of the acute condition[1]. DM remains one its most common cause while treatment attempts include the use of large doses of corticosteroids in the early stages.

Glaucomas have been linked severally with DM in different forms. Epidemiologically, the primary open angle as well as the primary closed angle glaucomas have higher incidence in DM patients as compared to normal population. However, it is the neovascular glaucoma that is actually the type of glaucoma belonging to diabetes eye diseases group in the strict sense of it; 32-43% of neovascular glaucomas are caused by proliferative diabetic retinopathy. [23,24] Ischaemic retina with subsequent release of VEGFs lead to proliferation; rubeosis irides causes causes fibrovascular proliferation and contractions which occlude the anterior chamber angle resulting in neovascualr glaucoma. Panretinal photocoagulation with laser and the use of anti-VEGFs in addition to intraocular pressure lowering medications are the main treatment modes for this challenging type of glaucoma.

Vision threatening eye diseases caused by diabetes mellitus such as diabetic retinopathy, cataract, ocular movement disorders, refractive change, diabetic papillopathy and anterior ischeamic optic neuropathy increase morbidity associated with the disease, the risk of blindness as well as reducing the quality of life of individuals affected. Multidisciplinary approach in management between the endocrinologist and ophthalmologist as well as good patient education is mandatory to ensure regular eye screening for early detection and prompt treatment of these eye diseases as well as ensuring optimal glyceamic, plasma lipids, renal and blood pressure control.

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