

# Review Article

## Review on the influence of Diabetes Mellitus in the visual prognosis of cataract surgery

**ABSTRACT:** India is deliberated the diabetes hub of the world, and a substantial amount of patients undergoing cataract surgery are diabetic. Keeping in this mind, we surveyed the different layers of the eye in managing the cataract in patients with diabetes. The changes in the cornea, intra ocular lens, choroid, and retina are the factors which influenced the visual prognosis of diabetic cataract patients. Better comprehension of different elements in charge of good result of cataract surgery in diabetic patients may direct us in better options in the management of these patients and advancing the outcomes.

**Key words:-** Cataract, Diabetes, Eye, Visual outcome, Health, Prognosis.

### INTRODUCTION:

India is an emerging country of diabetic in the world. WHO estimated that, 31.7 million people were affected by diabetes mellitus (DM) in India in the year 2000 & this figure is estimated to rise to 79.4 million by 2030, this is the largest number in any nation in the world. Tendency to develop almost 2/3 of all Type 2 and almost all Type 1 diabetics are expected to develop diabetic retinopathy (DR) over a period of time.<sup>1-3</sup> As per **Salil S Gadkari et al** DR prevalence in the entire is 21.7%.<sup>4</sup> In Prevalence of Diabetes Retinopathy in India studied by various author like, Raman *et al.* (18.1%), Rema *et al.* (17.6%), Namperumalsamy *et al.* (10.6%), Narendran *et al.* (26.2%) and Dandona *et al.* (22.58%), and so on.<sup>5-10</sup> Lian *et al.* (39%) in Hong Kong, Rodriguez-Poncelas *et al.* (12.3%) in Spain, Dawkins *et al.* (18.6%) in Timor Leste, Huang *et al.* (33.9%) in Singapore, Giloyan *et al.* (36.2%) in Armenia, Hajar *et al.* (27.8%) in Saudi Arabia, and Dutra Medeiros *et al.* (16.3%) in Portugal.<sup>11-17</sup> were some of the studies across the globe who also reported changing rates of prevalence of diabetic retinopathy. Diabetes affect almost all organ of the body like heart, kidney, liver and eye. Ophthalmic complications are also occurs various part of eye with staring to precorneal tear film to retina. This review article narrates how various part of the eye are influenced by the diabetes and the cause of poor visual prognosis in after cataract surgery when compared to the normal group.

However, overall outcomes of cataract surgery are excellent, patients with diabetes may have poorer visual outcomes than those without diabetes, and the outcome become to worst in operated eyes with active proliferative retinopathy<sup>18</sup> and/or preexisting

macular edema. To improve cataract surgical visual outcomes in patients with diabetes, adequate control of diabetic retinopathy with laser treatment before cataract surgery is necessary<sup>19</sup>. The most overwhelming postoperative complication is endophthalmitis, a severe intraocular infection, with several studies showing that patients with diabetes have an increased risk of developing this complication<sup>20-23</sup>, resulting in poorer outcomes<sup>24</sup>. In patients with diabetes, treatment may need to be more aggressive, with surgery performed earlier rather than later<sup>24</sup>. There is a direct effect of diabetes on the eye and its affect the visual acuity. There are following reason that may affect visual outcome in various way after cataract surgery in diabetes person.

### CORNEAL CHANGES IN DIABETES

The cornea feels 4-fold higher glucose in diabetic tear film than in control tears. 70% of diabetics suffer from corneal complications collectively called diabetic keratopathy. The diabetic cornea suffers from cellular dysfunction and dysfunctional repair mechanisms, which include recurrent erosions, delayed wound healing, ulcers, and edema which lead decrease in corneal sensitivity and transparency<sup>25</sup> which may be related to corneal epithelial defects. The person suffering with diabetes also suffer from a variety of corneal complications including superficial punctate keratopathy, trophic ulceration, persistent epithelial defect<sup>26,27</sup> and dry eye which is an important contributor to these problems. There are many causes for the Dry eye syndrome and one among is the aging process<sup>28</sup>. Some studies also shown a correlation between the glycated hemoglobin (HbA1C) and the presence of dry eye syndrome. It was noted that the higher the HbA1c values, the higher the rate of dry eye

syndrome<sup>29</sup>. Another study revealed that diabetic patients had lower values of tear secretion and values of tear break up time test (TBUT) than control group<sup>30</sup>. As per Jin et al patients with type 2 diabetes tend to develop tear film dysfunction. Therefore measurement of tear film break up time should be one of the routine test procedure to be followed in eye examination in diabetic patients<sup>31</sup>. Dry eye can lead to vision deficit, scarring and perforation of the cornea and secondary bacterial infection and it's finally lead to decrease in visual acuity. Diagnosis of dry eye syndrome at initial stage will be prevented from its complications<sup>26</sup>. Hence early finding of dry eye disorder in diabetic patients is significant for start of treatment in beginning times.

### CHANGES IN THE INTRAOCULAR LENS

Cataract is a main cause of vision impairment in people with diabetes. Various research have recorded a relationship among diabetes and cataract. This association is supported by a large amount of data from clinical epidemiological studies and basic science studies<sup>32-47</sup>. Based on the data from three population-based studies, the Beaver Dam Eye Study, the Blue Mountains Eye Study, and the Visual Impairment Project, documented associations between diabetes and both prevalent and incident posterior sub capsular cataract and, less consistently, with prevalent and incident cortical cataracts but not nuclear cataract<sup>29-43, 39-44, 48, 50</sup>. There is supplementary evidence that the risk of cataract increases with increasing diabetes duration and severity of hyperglycemia<sup>51</sup>. Deposition of advanced glycation end products in the lens has been postulated as one possible pathogenic mechanism for diabetic cataract<sup>52</sup>. Cataract surgery is the standard procedure for treating the patients with cataract and significant visual impairment. In individuals with diabetes, cataract occurs at a younger age and progresses more rapidly, resulting in higher rates of cataract surgery at a relatively young age<sup>53</sup>.

### CHANGES IN CHOROID

Diabetic retinopathy is an increasingly prevalent disease and a leading contributor to the cause for blindness worldwide. In addition to retinal changes, choroidal abnormalities are common in patients with diabetes. In diabetic patients, a few choroidal changes have been shown in various studies consistently; and the focus on choroidal thickness is essentially unique in relation to that in healthy individuals. Hence, understanding choroidal changes in diabetic retinopathy remains a real challenge and this gap is hindering efforts towards

better defining choroidal evaluation as a predictive factor for disease evolution and treatment response.

### CHANGES IN THE RETINA

Diabetic Retinopathy is a microvasculopathy in that the microvasculature leaks serum, increased vascular permeability, and capillaries are lost early in the disease. There is collective evidence that low-grade inflammation underlies the vascular complications of DR<sup>51-53</sup> inflammation is a nonspecific response of the body to tissue injury in which leukocytes are recruited to the inflamed tissue. Diabetic retinopathy is categorized best as a chronic low-level inflammation in which there are elevated systemic cytokines like TNF- $\alpha$  and IL-1 $\beta$  and elevated numbers of circulating activated leukocytes.<sup>54-56</sup>

### DIABETIC RETINOPATHY

Individuals with diabetes can have an eye disorder called diabetic retinopathy. This is when high glucose levels cause harm to blood vessels in the retina. These vessels can lead to further progression by its swelling and breakage which causes visual impairment. In its most developed stage, new blood vessels increase in number on the outside of the retina, which results to scarring and cell loss in the retina.

Diabetic retinopathy may develop through four stages: **Nonproliferative diabetic retinopathy (NPDR)** This is the early stage of diabetes with no symptoms and has mild signs of microaneurysms (swelling of the tiny blood vessels), hard exudates (waxy yellow appearance of the protein or lipid deposits), and hemorrhage (leakage of blood vessels). Macular edema can occur in the moderate cases and retinal ischemia (blockage of blood vessels) in severe case which further leads to visual loss. **Proliferative diabetic retinopathy (PDR)**. This is the most advanced stage of diabetic eye disease. In this neovascularization (new blood vessels) occurs which further bleed in to the vitreous causing floaters which will hinder the vision. These new blood vessels can form scar tissue. Accompanying scar tissue can contract and cause retinal detachment—the pulling away of the retina from underlying tissue, this is a serious condition which can affect both the central and peripheral vision.

### ANTERIOR ISCHEMIC OPTIC NEUROPATHY

Anterior ischemic optic neuropathy (AION) is an acute vascular condition of the optic nerve. Studies suggest that up to 25% of patients with AION have a history of diabetes<sup>57</sup>. In patients with diabetes, diabetic microvascular disease affecting the anterior part of the optic nerve is thought to cause the ischemia<sup>58, 59</sup>. The

optic disc in the contra-lateral eye of patients with AION is typically small in diameter with a small or absent cup, referred to as a "disc at risk." Patients with AION usually present with moderate loss of vision upon awakening, presumably related to nocturnal systemic hypotension<sup>60</sup>. Visual acuity is better than 20/200 in 60% of cases at presentation<sup>61</sup>. Untreated, AION generally remains stable, and recurrence in the same eye is unusual<sup>62</sup>. Good recovery of vision was observed in 43% of patients in the Ischemic Optic Neuropathy Decompression Trial<sup>63</sup>. There are no proven treatments for AION, and the Ischemic Optic Neuropathy Decompression Trial revealed no benefit of optic nerve decompression surgery<sup>64</sup>.

### DIABETIC PAPPILLOPATHY

Diabetic papillopathy is an uncommon optic nerve condition characterized by acute disc edema and mild vision loss<sup>65</sup>. Diabetic papillopathy is a risk factor for the progression of diabetic retinopathy<sup>66</sup>; and, in rare instances, papillopathy can precede the development of AION<sup>67</sup>. Early researchers hypothesized a toxic impact of abnormal glucose digestion on the optic nerve in people with diabetes; following studies have recommended that diabetic papillopathy might be an insignificant and reversible type of AION<sup>68</sup>. The importance of this condition is dual. Initially, this condition might be misdiagnosed as papilledema<sup>69</sup>. Second, telangiectasia at the optic disc in diabetic papillopathy might be mixed up as neovascularization in the optic disc as a feature of proliferative diabetic retinopathy, prompting needless laser photocoagulation. Diabetic papillopathy unexpectedly improves within a year, with good visual prognosis in many patients, vision returns to a level 20/30<sup>70</sup>. Proper control of diabetes, hypertension and renal disorder might help to resolve this condition. There is narrative proof that intraocular steroid infusion may profit patients with vision impairment<sup>71</sup>.

### OCULAR MOVEMENT DISORDERS

Extraocular motility disorders may occur in patients with diabetes, secondary to diabetic neuropathy, involving the third, fourth, or sixth cranial nerves. Rarely, simultaneous palsies of multiple extraocular nerves can occur<sup>72,73</sup>. Diabetes is the underlying cause in 25–30% of patients aged 45 years and older who develop acute extraocular muscle palsy<sup>74</sup>. In one study<sup>75</sup>, 1% of patients with diabetes were found to have cranial nerve palsies, compared with only 0.13% of control subjects. Among them, 41% had a third nerve palsy. In another population-based study, patients with sixth cranial

nerve palsy were six times more likely to have diabetes<sup>75</sup>. Patients with extraocular palsies present with binocular diplopia. Pupilsparing is an important diagnostic feature in diabetes-related third cranial nerve palsy, distinguishing it from surgical causes, such as intracranial aneurysm or tumor. In diabetic cranial nerve palsies, recovery of extraocular muscle function generally occurs within 3 months<sup>76,77,78</sup>.

### CONCLUSION:

The quantity of individuals with diabetes mellitus is expanding exponentially. Individuals with diabetes have not constantly shared the good results after cataract surgery as compared to the non-diabetic population. Visual prognosis of the cataract surgery may vary depending on the severity of the diabetic retinopathy. Therefore, we conclude from this review that one should consider reevaluating the various layers of the eye thoroughly compared with the preoperative, inoperative and post-operative factors to get a better visual prognosis in diabetes patients post cataract surgery.

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