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RESEARCH ARTICLE

Prevalence of ocular retinal disorders in patients with diabetes mellitus in a tertiary care hospital

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ABSTRACT

Background: Diabetes mellitus is a life style disorder that requires synergistic interaction among the patient, the family and health-care team. Retinopathy is the prime cause of new-onset blindness among young adults in the working age group. Therefore, it is important to screen patients with diabetes regularly for the development of retinal disease. **Aim and Objective:** Assessment of the prevalence of diabetic retinopathy (DR). To create awareness about avoidable blindness in diabetic patients and to direct the patient toward further evaluation and follow-up. **Materials and Methods:** The study is a hospital-based, non-interventional, cross-sectional prospective study. The visual disorders are evaluated in 500 patients attending Ophthalmology Outpatient Department of Kanyakumari Government Medical College Hospital. Estimation of visual acuity, color vision, slit lamp examination, intraocular pressure, retinoscopy and fundus examination, visual field analysis is done to detail the defective vision. **Results:** Data are analyzed using SPSS. The common pathological changes in the posterior segment causing defective vision are DR - 94 patients (18.8%), Combined retinopathy - 10 (2%). The common associated systemic disease is hypertension - 210 patients (42%). **Conclusion:** DR is the most common posterior segment manifestation of diabetes mellitus. Our goal is to prevent sight-threatening retinopathy from developing. Effective control of hyperglycemia, hypertension, and yearly screening fundus examination is essential for all the patients.

KEY WORDS: Retinopathy; Risk Factors; Screening; Visual Function

INTRODUCTION

Environmental and lifestyle changes interact with genetic factors that predispose to the "dual epidemic" of obesity and diabetes worldwide. In global, there were an estimated 19.4 million diabetes individuals in 1995 which is projected to increase to nearly 80 million in 2030.[1] As a consequence of its microvascular pathology, diabetes mellitus is now the leading cause of new blindness in people of working age group.[2] The incidence of blindness is 25 times higher in patients with diabetes than general population.[3] Diabetic retinopathy (DR) is the most common complication in Type I diabetes and nearly all patients will have some degree of retinopathy 15-20 years after diagnosis. Similarly, more than 60% of Type II diabetics will have evidence of retinopathy during this period.

Visual impairment due to retinopathy has a significant impact on patients psychological and social life. It is essential to screen patients with diabetes regularly for the development of retinal disease. The objective of our study is to assess

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the prevalence of DR in our institution, to create awareness about avoidable blindness among diabetic patients and direct them toward further evaluation, treatment, and follow-up. Therefore, the task of preventive care of diabetes mellitus with stress management to avoid ocular complications and ensure quality vision can be demanding in this life style disorder.

MATERIALS AND METHODS

Study Design

The present study is a hospital-based, non-interventional, cross-sectional prospective study. The study population consists of 500 diabetic patients attending Ophthamology Outpatient Department in Kanyakumari Government Medical College Hospital. The Institutional Ethical Committee Approval is obtained and study conducted for 6-month. Informed consent is obtained from all the selected individuals, who fit into the criteria. By way of providing proforma, the required data is collected.

Inclusion Criteria

This study included 500 diabetic patients in the age group 30-70 years.

Exclusion Criteria

Patients with acute injury to eye, secondary causes of glaucoma, lens-induced complications, previous surgeries such as keratoplasty or RD surgery.

Ophthalmic Examination

Visual acuity testing

The presenting distant visual acuity for both eyes is measured separately using a standard Snellen's chart properly illuminated at a distance of 6 m. Each participant had an anterior segment examination, using a torch, to detect the signs of conjunctival and corneal diseases. Slit lamp examination of cornea was done to determine the position, depth, and site of corneal abnormality and lens opacities.

Recording of intraocular pressure

Schiotz indentation tonometer was used to record the intraocular pressure of the anesthetized cornea. Visual field analysis – done using automated static perimeter (for selected cases) retinoscopy – was performed after pupillary dilatation to elicit the refractive status of the eye. Fundus examination was carried out using direct ophthalmoscope. Gonioscopy – to determine the type of angle in the anterior chamber of the eye (selected cases).

The following definitions are used for the study:

Visual impairment – WHO definitions

Category of visual impairment	Visual acuity with best possible correction	
	Maximum less than	Minimum equal to or better than
Low vision		
1	6/18	6/60
2	6/60	3/60
3	3/60	1/60
Blindness		
4	1/60	PL
5	NPL	

NPL: No perception of light, PL: Perception of light

DR is classified according to the early treatment of DR study criteria. It is classified into non-proliferative DR (NPDR) and proliferative DR (PDR). NPDR is further subdivided into mild, moderate, and severe. Diabetic macular edema is classified into clinically significant (CSME) and clinically nonsignificant.

All the participants of this study had the following tests done. Estimation of blood sugar and serum cholesterol -blood samples are collected and sent to the Biochemical Laboratory, Kanyakumari Government Medical College Hospital and the reports collected.

RESULTS

Among 500 diabetic patients examined, 266 are men and 234 are women (Table 1). Diabetic patients with choroidal and vitreoretinal lesions were 145 (54 women, 91 men) and the prevalence is 29%. Retinopathy is found to be the most common retinal diseases with prevalence rate 18.8% (Table 2). The prevalence rate of NPDR is 14.2%, PDR is 4.6%, and CSME 3.4% (Table 3). As the duration of diabetes increases, the percentage of cases of retinopathy also increases (Table 4). Among subjects with DR, 63% had associated high blood pressure (BP) (Table 5). Among patients with DR, visual impairment is present in 100%, color vision defect in 38% and elevated intraocular pressure in 2% (Table 6).

DISCUSSION

The 500 diabetic patients selected for this study were examined thoroughly for visual disorders in the posterior segment. Totally, 132 patients with defective vision were found to have vitreoretinal and choroidal lesions. The various manifestations among diabetics in our study are DR (18.8%), combined retinopathy (2%), branch retinal vein occlusion (0.6%), branch retinal artery occlusion (0.2%), retinal detachment (1.6%), macular hole (0.8%), chorioretinitis (0.4%), age-related macular degeneration (1.6%), and optic atrophy (1%).

Table 1: Distribution of subjects by age and sex

Age group (years)	Male	Female	Total
30-40	15	30	45
41-50	53	42	95
51-60	86	84	170
61-70	112	78	190
Total	266	234	500

Table 2: Association of posterior segment lesions in diabetes

Retinal diseases	Female	Male	Total	Prevalence (%)
Vitreous opacities	1	2	3	0.6
Vitreous hemorrhage	3	7	10	2
DR	34	60	94	18.8
Branch retinal vein occlusion	-	3	3	0.6
Branch retinal artery occlusion	-	1	1	0.2
Combined retinopathy	5	5	10	2
Retinal detachment	1	4	5	1
Macular hole	3	1	4	0.8
Chorioretinitis	1	1	2	0.4
Age-related macular degeneration	5	3	8	1.6
Optic atrophy	1	4	5	1
Total	54	91	145	29

DR: Diabetic retinopathy

Table 3: Various stages of retinopathy in diabetes mellitus

DR	Total number of patients	Prevalence (%)
NPDR mild	22	4.4
Moderate	38	7.6
Severe	11	2.2
PDR	23	4.6
Total	94	18.8
NPDR/PDR with CSME	17	3.4

NPDR: Non-proliferative diabetic retinopathy, PDR: Proliferative diabetic retinopathy, CSME: Clinically significant macular edema, DR: Diabetic retinopathy

Table 4: Distribution of retinopathy in relation to duration of diabetes

Duration of diabetes (years)	Number of subjects	DR	Prevalence (%)
0-5	162	13	8
5-10	130	24	18
10-15	110	25	22
15-20	98	32	32

DR: Diabetic retinopathy

Table 5: Association of various risk factors among patients with DR

Risk factors	Male	Female	Subjects with DR *n*=94 (%)
BMI>25	1	3	4 (4)
Physical inactivity	3	20	23 (24)
History of renal disease	2	-	2 (2)
High BP	35	25	60 (63)
Hyperglycemia	20	23	43 (45)
High lipids	7	13	20 (21)
Anemia	10	15	25 (26)

BP: Blood pressure, DR: Diabetic retinopathy

Table 6: Visual function in patients with DR

Visual function tests	Ocular functional changes	Subjects with DR *n*=94 (%)
Visual acuity	Visual impairment	
	Low vision (VA 6/18-3/60)	64 (68)
	Blindness (VA<3/60 in better eye)	30 (32)
Color vision	Normal	58 (62)
	Color vision defect	36 (38)
Intra ocular pressure	Normal (10-20 mmHg)	93 (98)
	Elevated (>20 mmHg)	1 (2)
Fundus changes	DR-NPDR	71 (76)
	PDR	23 (24)
	NPDR/PDR with CSME	17 (18)
	Retinal detachment	5 (1)
	Vitreous hemorrhage	10 (2)

DR: Diabetic retinopathy, NPDR: Non-proliferative diabetic retinopathy, PDR: Proliferative diabetic retinopathy, CSME: Clinically significant macular edema

Retinopathy is found to be the most common retinal disease causing visual impairment. Large prospective clinical studies show a strong relationship of glycemia to incidence and progression of retinopathy. Sight-threatening retinopathy eventually afflicts virtually all patients with diabetes mellitus. One of the pathogenesis mechanism is aldose reductase initiated accumulation of sorbitol leading to selective degeneration of mural cells in the retinal capillaries.[4] A second role of polyol pathway is its relationship to the development of abnormal basement membrane thickening with closure of retinal vessels.[5] Increased growth hormone results in plasma protein abnormalities with increased plasma viscosity and decreased retinal blood flow. Retinal hypoxia is a result of decreased oxygen release from hemoglobin. This has been attributed to decreased red blood cell 2,3- diphosphoglycerate increased hemoglobin A_1 and increased blood lipids.[6]

DR – NPDR is characterized by retinal small vessel occlusion and increased permeability due to loss of blood-retinal barrier.[7] Various fundus changes include microaneurysms, hemorrhages, cotton wool spots, intraretinal microvascular abnormalities, and venous abnormalities. Cotton wool spots are a frequent finding in both normotensive and hypertensive diabetics with retinopathy that indicates impending neovascularization of the retina. In PDR, neovascularization and associated intra/preretinal hemorrhages, scarring, and retinal detachment occur.[8] Proliferation of new vessels occur in response to vasogenic factors released by ischemic retina. Macular edema is due to extravasation of plasma proteins across abnormally leaky capillaries. The prevalence of DR 18.8% in our study is similar to that of Chennai Urban Population Study (CUPS) study[9] and the prevalence of CSME 3.4% is similar to studies by Rema et al. in India.[10]

Combined retinopathy - among 185 diabetic subjects with hypertension, 73 presented with DR, and 10 had both hypertensive and DR. The retinal changes mirror the systemic circulation and its severity correlates well with the development of systemic complications of hypertension and with survival.[11] There is vasospastic reaction to an acute pressure rise and arteriosclerotic response to chronic elevation. Pathological ocular findings include optic nerve edema, cotton wool spots, hemorrhage, intraretinal lipid - macular star configuration, and focal infarcts.[12] Treatment with antihypertensives can halt the progression of retinal changes. Vitreous hemorrhage (2%) into the subvitreal space is due to neovascular growth and fibrovascular tissue contraction, common in diabetic patients. Blood completely fills the eye and blocks the view of retina, takes weeks to months to clear.[13] In retinal detachment (1%), the hypoxic retina elaborates an angiogenic factor that induces neovascularization. Contractile membranes thus grow across the retina in PDR, and later shrinkage of the fibroglial tissue leads to tractional retinal detachment.[14] Treatment consists of reduction of traction by banding, buckling, scleral resection, or vitrectomy.

In relation to visual function, visual impairment (100%) has resulted from vitreous hemorrhage, retinal detachment, macular edema, refractive changes, color vision defects, and cataract. The prevalence of legal blindness among diabetics is found to increases with increasing age similar to Wisconsin Epidemiologic Study of DR study. Color vision defect in 36 subjects can occur even before ophthalmoscopically detectable vascular retinopathy.[15] Elevated intraocular pressure present in one subject is a complication of PDR.[16]

Regarding the duration of hyperglycemia, the incidence of DR is found to increase with the length of time the patient had diabetes; 8% with duration 0-5 years to 32% with duration 15-20 years. Similar findings have been reported by Klein et al.[17] We find that poor control of diabetic status in our study participants to be associated with DR. Various case–control studies - diabetes control and complications trial, UKPDS,[18] Kumamoto[19] have proved the importance of tight glycemic control and BP control in the prevention of microvascular complications of diabetes mellitus. The prevalence of hypertension 42% among diabetics in our study correlates with Thailand study.[20] They are more likely to develop severe levels of retinopathy and macular edema and have rapid progression than diabetics without hypertension.[21] Target BP should most likely be maintained as low as possible. Elevated serum lipids (triglycerides [TG], low-density lipoprotein [LDL], VLDL) are associated with extravasated lipid in the retina and vision loss.[22] Nephropathy as manifested by microalbuminuria and protenuria is a risk factor for onset and progression of DR. The same has been suggested by appropriate BP control in diabetes trial.[23] Low hematocrit, hemoglobin <12 g/dl is a risk factor for development of PDR and vision loss.

CONCLUSION

The present study has been undertaken to provide information on the ocular retinal disorders that are prevalent among diabetic patients. The most common retinal disease causing visual impairment is DR and the prevalence 18.8% in our study is similar to The CUPS by Rema et al. Ocular screening procedures done yearly along with tight control of blood glucose, BP, serum lipids, and hematocrit levels can reduce the progression of DR. The newer diagnostic ophthalmic imaging technique optical coherence tomography quantifies retinal thickening and is the objective method of choice currently. Management includes photocoagulation therapy, intraocular surgery, and low-vision rehabilitation for visually disabled. As new therapies for DR emerge, the need to collect and monitor new epidemiological data is important to evaluate the impact and effectiveness of these therapies. Thus vision can be preserved for a better living condition.

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