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Prevalence of diabetic retinopathy among diabetic patients referred to Patna medical college & hospital, Patna, Bihar

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Abstract
India is set to emerge as the diabetic capital of the world. According to the WHO, 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, the largest number in any nation in the world. Almost two-third of all Type 2 and almost all Type 1 diabetics are expected to develop diabetic retinopathy (DR) over a period of time. Prevalence provides a cross-sectional snapshot of morbidity at that point or period. Studies have shown that as the duration of diabetes increases so does the chance of developing DR. With a chronic disease like diabetes, new cases get added to the pool every passing year and they remain within the prevalence pool for the remainder of their lives. Hence based on above findings the present study was planned for study of Prevalence of Diabetic retinopathy among Diabetic patients Referred to Patna Medical College & Hospital, Patna, Bihar.

The present study was planned in Department of Ophthalmology Patna Medical College & Hospital, Patna, Bihar, India. The study was conducted from March 2018 to July 2018. Total 20 cases of the patients suffered from diabetes were enrolled in the present study. Detailed history along with blood pressure measurement and written informed consent were obtained from each patients prior to the study.

The data generated from the present study concludes that prevalence of diabetes and DR among both urban and rural population and also risk factors that influence strongly the development of DR. Prevalence studies do have significance apart from providing health-care professionals a crucial information regarding the disease burden; they also implicate the challenges to be conquered in diagnosis, therapy, prognosis, and educating the patient.

Keywords: diabetic retinopathy, diabetic, eyes, DM, Bihar, etc

Introduction

Diabetes mellitus (DM) is a major medical problem throughout the world. Diabetes causes an array of long-term systemic complications that have considerable impact on the patient as well as society, as the disease typically affects individuals in their most productive years. An increasing prevalence of diabetes is occurring throughout the world. In addition, this increase appears to be greater in developing countries. The etiology of this increase involves changes in diet, with higher fat intake, sedentary lifestyle changes, and decreased physical activity [1].

Diabetic retinopathy often has no early warning signs. Even macular edema, which can cause rapid vision loss, may not have any warning signs for some time. In general, however, a person with macular edema is likely to have blurred vision, making it hard to do things like read or drive. In some cases, the vision will get better or worse during the day.

The first stage, called non-proliferative diabetic retinopathy (NPDR), has no symptoms. Patients may not notice the signs and have 20/20 vision. The only way to detect NPDR is by fundus photography, in which microaneurysms (microscopic blood-filled bulges in the artery walls) can be seen. If there is reduced vision, fluorescein angiography can show narrowing or blocked retinal blood vessels clearly (lack of blood flow or retinal ischemia).

Macular edema, in which blood vessels leak their contents into the macular region, can occur at any stage of NPDR. Its symptoms are blurred vision and darkened or distorted images that are not the same in both eyes. Ten percent (10%) of diabetic patients will have vision loss related to macular edema. Optical Coherence Tomography can show areas of retinal thickening due to fluid accumulation from macular edema.

In the second stage, abnormal new blood vessels (neovascularisation) form at the back of the eye as part of proliferative diabetic retinopathy (PDR); these can burst and bleed (vitreous hemorrhage) and blur the vision, because these new blood vessels are fragile. The first time this bleeding occurs, it may not be very severe. In most cases, it will leave just a few specks of blood, or spots floating in a person's visual field, though the spots often go away after a few hours.

These spots are often followed within a few days or weeks by a much greater leakage of blood, which blurs the vision. In extreme cases, a person may only be able to tell light from dark in that eye. It may take the blood anywhere from a few days to months or even years to clear from the inside of the eye, and in some cases the blood will not clear. These types of large hemorrhages tend to happen more than once, often during sleep. On funduscopic exam, a doctor will see cotton wool spots, flame hemorrhages (similar lesions are also caused by the alpha-toxin of Clostridium novyi), and dot-blot hemorrhages.

Patients with diabetes often develop ophthalmic complications, such as corneal abnormalities, glaucoma, iris neovascularization, cataracts, and neuropathies. The most common and potentially most blinding of these complications, however, is diabetic retinopathy, which is, in fact, the leading cause of new blindness in persons aged 25-74 years in the United States. Approximately 700,000 persons in the United States have proliferative diabetic retinopathy, with an annual incidence of 65,000. An estimate of the prevalence of diabetic retinopathy in the United States showed a high prevalence of 28.5% among those with diabetes aged 40 years or older [2].

The exact mechanism by which diabetes causes retinopathy remains unclear, but several theories have been postulated to explain the typical course and history of the disease [3].

In the initial stages of diabetic retinopathy, patients are generally asymptomatic, but in more advanced stages of the disease patients may experience symptoms that include floaters, distortion, and/or blurred vision. Microaneurysms are the earliest clinical sign of diabetic retinopathy. Renal disease, as evidenced by proteinuria and elevated blood urea nitrogen (BUN)/creatinine levels, is an excellent predictor of retinopathy; both conditions are caused by DM-related microangiopathies, and the presence and severity of one reflects that of the other. Aggressive treatment of the nephropathy may slow progression of diabetic retinopathy and neovascular glaucoma.

A study by Ito et al. indicated that in patients with type 2 diabetes, the presence of reduced peripheral nerve conduction velocity is associated with the existence of early diabetic retinopathy. The report included 42 patients with type 2 diabetes (42 eyes), who had either no diabetic retinopathy or mild nonproliferative diabetic retinopathy. The investigators found that the latter group had significantly lower sural sensory conduction velocity and tibial motor conduction velocity than did patients with no diabetic retinopathy, with logistic regression analysis showing these velocities to be independent risk factors for the mild nonproliferative eye disease. The exact mechanism by which diabetes causes retinopathy remains unclear, but several theories have been postulated to explain the typical course and history of the disease [4].

Growth hormone appears to play a causative role in the development and progression of diabetic retinopathy. Diabetic retinopathy has been shown to be reversible in women who had postpartum hemorrhagic necrosis of the pituitary gland (Sheehan syndrome). This led to the controversial practice of pituitary ablation to treat or prevent diabetic retinopathy in the 1950s. This technique has since been abandoned because of numerous systemic complications and the discovery of the effectiveness of laser treatment. It should be noted that diabetic retinopathy has been reported in patients with hypopituitarism as well.

The variety of hematologic abnormalities seen in diabetes, such as increased erythrocyte aggregation, decreased red blood cell deformability, increased platelet aggregation, and adhesion, predispose the patient to sluggish circulation, endothelial damage, and focal capillary occlusion. This leads to retinal ischemia, which, in turn, contributes to the development of diabetic retinopathy.

Fundamentally, diabetes mellitus (DM) causes abnormal glucose metabolism as a result of decreased levels or activity of insulin. Increased levels of blood glucose are thought to have a structural and physiologic effect on retinal capillaries causing them to be both functionally and anatomically incompetent.

A persistent increase in blood glucose levels shunts excess glucose into the aldose reductase pathway in certain tissues, which converts sugars into alcohol (eg, glucose into sorbitol, galactose to dulcitol). Intramural pericytes of retinal capillaries seem to be affected by this increased level of sorbitol, eventually leading to the loss of their primary function (ie, autoregulation of retinal capillaries). This results in weakness and eventual saccular outpouching of capillary walls. These microaneurysms are the earliest detectable signs of DM retinopathy.

In patients with proliferative diabetic retinopathy (PDR), nocturnal intermittent hypoxia/reoxygenation that results from sleep-disordered breathing may be a risk factor for iris and/or angle neovascularization [5].

Neovascularization is most commonly observed at the borders of perfused and nonperfused retina and most commonly occurs along the vascular arcades and at the optic nerve head. The new vessels break through and grow along the surface of the retina and into the scaffold of the posterior hyaloid face. By themselves, these vessels rarely cause visual compromise, but they are fragile and highly permeable. These delicate vessels are disrupted easily by vitreous traction, which leads to hemorrhage into the vitreous cavity or the preretinal space.

These new blood vessels initially are associated with a small amount of fibroglial tissue formation. However, as the density of the neovascular frond increases, so does the degree of fibrous tissue formation.

In later stages, the vessels may regress, leaving only networks of avascular fibrous tissue adherent to both the retina and the posterior hyaloid face. As the vitreous contracts, it may exert tractional forces on the retina via these fibroglial connections. Traction may cause retinal edema, retinal heterotropia, and both tractional retinal detachments and retinal tear formation with subsequent detachment.

In patients with type I diabetes, no clinically significant retinopathy can be seen in the first 5 years after the initial diagnosis of diabetes is made. After 10-15 years, 25-50% of patients show some signs of retinopathy. This prevalence increases to 75-95% after 15 years and approaches 100% after 30 years of diabetes. Proliferative diabetic retinopathy (PDR) is rare within the first decade of type I diabetes diagnosis but increases to 14-17% by 15 years, rising steadily thereafter.

In patients with type II diabetes, the incidence of diabetic retinopathy increases with the disease duration. Of patients with type II diabetes, 23% have nonproliferative diabetic retinopathy (NPDR) after 11-13 years, 41% have NPDR after 14-16 years, and 60% have NPDR after 16 years.

Systemic hypertension, in the setting of diabetic nephropathy, correlates well with the presence of retinopathy. Independently, hypertension also may complicate diabetes in that it may result in hypertensive retinal vascular changes superimposed on the preexisting diabetic retinopathy, further compromising retinal blood flow.

Proper management of hyperlipidemia (elevated serum lipids) may result in less retinal vessel leakage and hard exudate formation, but the reason behind this is unclear.

Pregnant women with proliferative diabetic retinopathy do poorly without treatment, but those who have had prior

panretinal photocoagulation remain stable throughout pregnancy. Pregnant women without diabetic retinopathy run a 10% risk of developing NPDR during their pregnancy: of those with preexisting NPDR, 4% progress to the proliferative type [6].

A study by Toda et al. found that among pregnant women with diabetic retinopathy, those who showed progression of the eye disorder tended to have a longer duration of diabetes, to have had diabetic retinopathy prior to pregnancy, and to have higher blood pressure in the second trimester [7].

Of the approximately 16 million Americans with diabetes, 50% are unaware that they have it. Of those who know they have diabetes, only half receive appropriate eye care. Thus, it is not surprising that diabetic retinopathy is the leading cause of new blindness in persons aged 25-74 years in the United States.

Approximately 700,000 Americans have proliferative diabetic retinopathy, with an annual incidence of 65,000. Approximately 500,000 persons have clinically significant macular edema, with an annual incidence of 75,000.

Diabetes is responsible for approximately 8000 eyes becoming blinded each year, meaning that diabetes is responsible for 12% of blindness [8]. The rate is even higher among certain ethnic groups. An increased risk of diabetic retinopathy appears to exist in patients of Native American, Hispanic, and African American heritage. With increasing duration of diabetes or with increasing age since its onset, there is a higher risk of developing diabetic retinopathy and its complications, including diabetic macular edema or proliferative diabetic retinopathy.

Nonetheless, a literature review by Sabanayagam et al. indicated that although the prevalence of diabetes has increased worldwide, the incidence of diabetic retinopathy–related blindness has fallen, especially in developed nations [9].

Approximately 8,000 eyes become blind yearly because of diabetes. The treatment of diabetic retinopathy entails tremendous costs, but it has been estimated that this represents only one eighth of the costs of Social Security payments for vision loss. This cost does not compare to the cost in terms of loss of productivity and quality of life.

The Early Treatment for Diabetic Retinopathy Study has found that laser surgery for macular edema reduces the incidence of moderate visual loss (doubling of visual angle or roughly a 2-line visual loss) from 30% to 15% over a 3-year period. The Diabetic Retinopathy Study has found that adequate scatter laser panretinal photocoagulation reduces the risk of severe visual loss (< 5/200) by more than 50% [10].

India is set to emerge as the diabetic capital of the world. According to the WHO, 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, the largest number in any nation in the world. Almost two-third of all Type 2 and almost all Type 1 diabetics are expected to develop diabetic retinopathy (DR) over a period of time. Prevalence provides a cross-sectional snapshot of morbidity at that point or period. Studies have shown that as the duration of diabetes increases so does the chance of developing DR. With a chronic disease like diabetes, new cases get added to the pool every passing year and they remain within the prevalence pool for the remainder of their lives. Hence based on above findings the present study was planned for study of Prevalence of Diabetic retinopathy among Diabetic patients Referred to Patna Medical College & Hospital, Patna, Bihar.

Methodology

The present study was planned in Department of Ophthalmology Patna Medical College & Hospital, Patna, Bihar, India. The study was conducted from March 2018 to July 2018. Total 20 cases of the patients suffered from diabetes were enrolled in the present study. Detailed history along with blood pressure measurement and written informed consent were obtained from each patient prior to the study.

Visual acuity was assessed by Snellen chart. To diagnose DR in diabetic patients, 90D and binocular indirect ophthalmoscopy examination was done by a single examiner after dilating the pupils of both eyes by 1% Tropicamide eye drops. Retinopathy was classified according to the International classification of Diabetic Retinopathy as Non proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR). On the presence of diabetic macular edema (ME), the patients were further classified into mild, moderate or severe macular edema [11].

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Age above 20 years. All patients diagnosed with Type 2 DM and were examined by the ophthalmologist.

Exclusion Criteria: All patients diagnosed of Type 2 DM and did not undergo ophthalmologist examination.

Results & Discussion

The incidence of Diabetes Mellitus is increasing dramatically, and India is expected to have more than 60 million diabetics by the year 2025 [11, 12]. Diabetic retinopathy is currently a major cause for visual loss in the industrialized world. Duration of diabetes appears to be the most important risk factor in the development and progression of diabetic retinopathy [13]. Diabetic retinopathy cases are expected to increase drastically in coming years. Successful management of diabetic retinopathy requires a combination of glucose and BP control, and, in some patients, laser therapy, pharmaco therapy and vitrectomy. Because of delays in seeking treatment diabetic retinopathy remains a major cause for blindness. The vast majority of diabetic patients who lose vision do so, not because of an inability to treat their disease, but rather due to lack of awareness.

Studies have reported that patients with T1DM are at a higher risk for developing long-term vascular complications due to their younger age at onset and longer duration of the disease. Diabetic retinopathy (DR) is one of the common complications among people with T1DM and is responsible for 86% of the blindness among the younger age groups. Longer diabetes duration, poorer glycemic and blood pressure control are strongly associated with DR. After 20 years of diabetes, nearly all patients with T1DM develop some degree of DR [14].

Most patients who develop DR have no symptoms until it

progresses to an advanced stage. Further, the treatment for DR can be beneficial for both symptom amelioration and reduction in disease progression. It is highly recommended to have an annual screening for DR among patients with T1DM as it provides an opportunity to detect and manage vision-threatening stages of the disease to reduce the risk of loss of vision.

In India, T1DM patients experience many socioeconomic, health systems, and cultural barriers to seek long-term continuous care [15]. The majority of patients are unaware of the requirement for regular screening and therefore are not aware of their DR status [16]. Further, there is an acute shortage of manpower and infrastructure for DR screening and management in India. A recent facility assessment survey across 11 cities in India indicated that more than 40% of eye departments/hospitals lacked the infrastructure necessary for diagnosis and treatment of DR. More than half the eye care facilities would like further training for their ophthalmologist in the retina. There was a shortage of low-vision therapists, counselors, and optometrist across all types of facilities. Nearly half the hospitals did not possess a system to track patients needing treatment or for follow-up [17].

Table 1: Demographic Detail

Parameter	No. of Cases
Age	
21 – 30 years	1
31 – 40 years	3
41 – 50 years	9
51 – 60 years	5
60 & above years	2
Sex	
Males	12
Females	8
Locality	
Urban	11
Rural	9
Educational Qualifications	
Primary	1
Secondary	3
Undergraduate	5
Post-Graduate	11
Occupation	
Working	16
Not Working	4
Self-Reported Diabetes	
Yes	8
No	12
Total	20

Table 2: Diabetic Retinopathy

Parameter	No. of Cases
No retinopathy	14
Non-proliferative retinopathy	2
Proliferative retinopathy	3
Complicated	1
Total	20

The guidelines issued by the vision 2020 and developed by Aravind eye care system had estimated prevalence for DM 4% and DR 11% in all cases of DM for all states in India for 2007. The values from the present study probably signify a shift upward in DR prevalence although this could also be explained by selection bias since the study reported here was hospital-based, not population-based. This is a reflection of a real rising trend in prevalence, it could, along with population growth and increased prevalence of DM, would further increase the burden of disease computed in 2007 [18].

Now diabetic patients are being referred to ophthalmologists according to the type, onset and duration of diabetes. As evidence of strong link between DR and HbA1c is rising, it is time to consider HbA1c level as one of the proposed factors that may influence the referral. The treating doctor should persuade the patients to undergo screening for retinopathy whether needed or not. This humane attitude between the family physicians or general practitioners and ophthalmologists bears cardinal position in diabetes education programs. Positive results can be achieved using patient empowerment approach and regularly conducting diabetes self-management educational programs using state-of-the-art methods emphasizing upon lifestyle modification.

Early detection and management of retinopathy is very important as visual prognosis in late cases is poor even after treatment. However, most patients seek treatment only after they develop significant visual loss. Because of this delay, diabetic retinopathy remains a major cause for blindness. It has been reported that the risk of severe visual loss would be as low as 5% if periodic fundus evaluation and recommended treatment protocols are followed in diabetic patients.

A significant limitation of this study is that it is difficult to postulate our prevalence findings among the community. Therefore, we suggest population-based studies in rural and urban sectors of Bihar to be planned and conducted in order to have a better and accurate understanding of the awareness and knowledge about diabetes complications. Also, an in-depth interview about diabetes and its ocular complications can be conducted among the subjects visiting the outpatient department to have detailed insight.

Conclusion

The data generated from the present study concludes that prevalence of diabetes and DR among both urban and rural population and also risk factors that influence strongly the development of DR. Prevalence studies do have significance apart from providing health-care professionals a crucial information regarding the disease burden; they also implicate the challenges to be conquered in diagnosis, therapy, prognosis, and educating the patient.

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