Section: Miscellaneous

Original Research Article

TO STUDY THE CORRELATION OF RENAL DYSFUNCTION WITH DIABETIC RETINOPATHY IN TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: Globally, Diabetic Retinopathy (DR) is a leading cause of visual impairment among individuals with diabetes mellitus (DM). Diabetes causes both microvascular and macrovascular complications. The microvascular complications include diabetic retinopathy (DR), nephropathy (DN), and neuropathy. DR is a significant contributor to new blindness cases, particularly in the productive age group of 20-75 years, making it a serious socio-economic concern. In India, DR was present in 16.9% population. Several risk factors contribute to the onset and progression of DR, including the duration of diabetes, diabetic nephropathy, neuropathy, foot ulcers, hypertension, and serum cholesterol levels As a microvascular complication of type 1 DM, the correlation between DR and renal dysfunction has been well established. [4, 5] However, this association is inconclusive in T2DM, especially in the Asian population. The aim is to study the correlation between Renal Dysfunction and diabetic retinopathy in Type 2 Diabetes Mellitus (T2DM) patients. **Materials and Methods:** The study was conducted at the Northern Railway Central Hospital, New Delhi, from August 2022 to December 2024. It was an observational, analytical, cross-sectional study. A consecutive sampling method was used, and a total of 200 cases were evaluated. All patients underwent a detailed workup to establish the diagnosis, duration, and level of control of DM. Subsequently, they all underwent retinal examination, and Diabetic Retinopathy grading was done as per the ETDRS classification. All patients were evaluated biochemically for their renal function. **Result:** Among 200 participants range of S. Creat. was 0.5 to 2.4, with a mean of 0.974 ± 0.3148. The average HbA1c% % level was higher in the increased creatinine group. On an ANOVA test, S. Cr. levels are significantly higher in PDR than NPDR population. **Conclusion:** Elevated S. Creat. levels were significantly linked to severe DR (p=0.028), emphasizing the interconnectedness of DN and DR and the importance of renal function monitoring and control in DR management.

INTRODUCTION

Globally, Diabetic Retinopathy (DR) is a leading cause of visual impairment among individuals with diabetes mellitus (DM). It causes damage to the retinal blood vessels, ultimately leading to progressive visual dysfunction. It arises as a consequence of prolonged hyperglycemia, resulting in microvascular damage. Diabetes causes both microvascular and macrovascular complications. The macrovascular complications are ischemic heart disease, peripheral vascular disease, and cerebrovascular disease. The microvascular complications include diabetic retinopathy (DR), nephropathy (DN), and neuropathy.[1]

Globally, DR is a significant contributor to new blindness cases, particularly in the productive age group of 20-75 years. This has made it a social and economic concern of mammoth proportions. Within a study from India, DR was present in 16.9%, with sight-threatening diabetic retinopathy (STDR) observed in 3.6% and mild retinopathy in 11.8%.[2]

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Several risk factors contribute to the onset and progression of DR, including the duration of diabetes, diabetic nephropathy, neuropathy, foot ulcers, hypertension, and serum cholesterol levels. Other factors, such as fasting blood glucose levels, HbA1c, and the patient's age, are also crucial in determining the risk of DR development.[3]

As a microvascular complication of type 1 DM, the correlation between DR and renal dysfunction) has been well established,[4,5] however, currently the associations of renal function with DR, its severity, and severe visual impairment in T2DM are inconclusive,[6-8] especially in the Asian population.[9,10] It is therefore essential to conduct further studies to clarify the issue.

AIM: To study the correlation between Renal dysfunction and diabetic retinopathy in Type 2 Diabetes Mellitus (T2DM) patients.

Objective: To assess role of management and monitoring of renal dysfunction in the prevention, retardation and management of diabetic retinopathy.

MATERIALS AND METHODS

Study Area: The Departments of General Surgery, General Medicine and Ophthalmology at the Northern Railway Central Hospital, New Delhi.

Study Period: A period of 30 months, from August 2022 to December 2024.

Nature of Study: An observational, analytical, cross-sectional study.

Inclusion Criteria

All patients presenting with

1. Laboratory confirmed cases of both sexes, having Type 2 DM.
2. Age more than > 35 years.
3. Patients who have had diabetes for 5 years or more.

Exclusion Criteria

1. Patients with Type 1 DM
2. Congenital ocular disease: Myopic fundus
3. Traumatic posterior chamber abnormality, Retinopathy of prematurity
4. Metabolic disorder other than DM, Cataract eye.
5. Patients not having at least 2 reports of HbA1c/ year for at least the preceding 5 years.
6. Patients receiving any form of renal replacement therapy

Sampling Method and Size

A consecutive sampling method was used, and 200 patients were enrolled during the study period. A total of 200 cases were evaluated.

Methodology

All patients who attended the Departments of General Medicine, General Surgery and Ophthalmology at the Northern Railway Central Hospital, New Delhi, and were found to have a raised blood sugar or a history of DM were referred to the Medicine department for a detailed work up to establish the diagnosis, duration and level of control of DM. They underwent HbA1c examination, and their previous reports were also reviewed. The average HbA1c was the average of all available HbA1c reports over at least the last three years, with at least 2 HbA1c reports per year.

Subsequently, they all underwent retinal examination by a professional hand-held direct ophthalmoscope. Consultants in the department of ophthalmology did all examinations personally. Diabetic Retinopathy grading was done as per the ETDRS classification:

Diabetic Retinopathy level	Retinal findings
Mild NPDR	Microaneurysm
Moderate NPDR	Haemorrhages (Dot or blot) or MAs in one to three retinal quadrants and/or cotton wool spots, hard exudates, or venous beading
Severe NPDR	Intraretinal haemorrhages (> 20 in each quadrant), venous beading in two or more quadrants, or an IRMA in one or more quadrants
PDR	NPDR that has progressed to PDR, and they exhibit either neovascularization of the disc/elsewhere or vitreous/preretinal haemorrhage

All patients underwent a biochemical evaluation of their kidney function. The reports of blood urea and serum creatinine (S. Cr.) were done after ensuring that the hydration of the patient was adequate.

The results were analysed using the Chi-Square test to find the association of deranged KFT in the causation and severity of DR.

RESULTS

In this study, among 200 participants minimum creatinine was 0.5 and the maximum was 2.4, with mean 0.974 ± 0.3148. Average HbA1C % level was higher in increased creatinine group.

Table 1: ?

Variables	Total patients	Minimum	Maximum	Mean	SD
Blood urea(mg/dl)	200	24.0	100.0	44.780	12.0509
Serum Creatinine (mg/dl)	200	0.5	2.4	0.974	0.3148
Average HbA1c (%)	200	5.8	12.6	7.678	1.4986

Table 2: ?.

Variables	Normal		NPDR		PDR		ANOVA test, P -value
	Mean	SD	Mean	SD	Mean	SD	
B. UREA(mg/dl)	43.5	10.6	44.1	10.6	52.3	18.8	0.069
S.CREATININE (mg/dl)	0.9	0.3	0.9	0.3	1.2	0.5	0.028

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On applying the Anova test, S. Cr. levels are significantly higher in PDR population than the NPDR population.

DISCUSSION

We found that in the presence of renal dysfunction, Type 2 DM was significantly associated with the presence and severity of DR. Prior studies have demonstrated that DR and DN have a similar pathogenesis and clinical course.[11]

Other studies have also found that in patients with severe DR, the mean serum Cr level tended to be higher.[12] Another large cohort study indicated that the severity of DR was related to CKD progression.[13]

The prevalence of DN in T2DM has been reported as 17% to 58%, and is higher in Asia than in Europe.[14] Other studies have shown that renal dysfunction is independently associated with DR in adult T2DM patients.[7,13] El-Asrar et al. reported that the risk of diabetic nephropathy was higher in patients with T2 DM according to the severity of DR, but lower than the increased risk in patients with T1 DM.[15]

CONCLUSION

Our results demonstrated that elevated serum creatinine levels were significantly linked to severe DR (p=0.028). This is consistent with Seyed et al. (2022),[16] and Matuszewski et al. (2020),[17] emphasizing the interconnectedness of diabetic nephropathy and retinopathy and the importance of renal function monitoring and control in diabetes management.

REFERENCES

1. Sharma PK, Kumar K, Dubey A, Nitin Kushwaha, Maravi P. Clinical study on association of diabetic retinopathy severity with HbA1c level. Indian Journal of Clinical and Experimental Ophthalmology. 2024 Jul 4;10(2):248–55.
2. Vashist P, Senjam SS, Gupta V, Manna S, Gupta N, Shamanna BR, Bhardwaj A, Kumar A, Gupta P. Prevalence of diabetic retinopahty in India: Results from the National Survey 2015-19. Indian J Ophthalmol. 2021 Nov;69(11):3087-3094.
3. Vujosevic S, Aldington SJ, Silva P, Hernández C, Scanlon P, Peto T, et al. Screening for diabetic retinopathy: new perspectives and challenges. Lancet Diabetes Endocrinol. 2020;8(5):337-47
4. Wolf G, Müller N, Mandecka A, Müller UA. Association of dia¬betic retinopathy and renal function in patients with types 1 and 2 diabetes mellitus. Clin Nephrol 2007;68:81–6.
5. Pedro RA, Ramon SA, Marc BB, Juan FB, Isabel MM. Prevalence and relationship between diabetic retinopathy and nephropathy, and its risk factors in the North-East of Spain, a population-based study. Ophthalmic Epidemiol 2010; 17: 251-265
6. Wolf G, Müller N, Mandecka A, Müller UA. Association of diabetic retinopathy and renal function in patients with types 1 and 2 diabetes mellitus. Clin Nephrol 2007; 68: 81-86
7. Penno G, Solini A, Zoppini G, Orsi E, Zerbini G, Trevisan R, et al. Rate and determinants of association between advanced reti¬nopathy and chronic kidney disease in patients with type 2 dia¬betes: the Renal Insufficiency And Cardiovascular Events (RI¬ACE) Italian multicenter study. Diabetes Care 2012;35:2317–23
8. Man RE, Sasongko MB, Wang JJ, MacIsaac R, Wong TY, Sabanayagam C, Lamoureux EL. The Association of Estimated Glomerular Filtration Rate With Diabetic Retinopathy and Macular Edema. Invest Ophthalmol Vis Sci 2015; 56: 4810-4816
9. Chen YH, Chen HS, Tarng DC. More impact of microalbuminuria on retinopathy than moderately reduced GFR among type 2 diabetic patients. Diabetes Care 2012; 35: 803-808
10. Sabanayagam C, Foo VH, Ikram MK, Huang H, Lim SC, Lamoureux EL, Tai ES, Wong TY. Is chronic kidney disease associated with diabetic retinopathy in Asian adults? J Diabetes 2014; 6: 556-563
11. Manaviat MR, Afkhami M, Shoja MR. Retinopathy and microalbuminuria in type II diabetic patients. BMC Ophthalmol 2004; 4: 9
12. Lee G W, Lee C H, Kim S G. Association of advanced chronic kidney disease with diabetic retinopathy severity in older patients with diabetes: a retrospective cross-sectional study; J Yeungnam Med Sci 2023;40(2):146-155
13. Grunwald JE, Pistilli M, Ying GS, Daniel E, Maguire M, Xie D, et al. Association between progression of retinopathy and con¬current progression of kidney disease: findings from the Chron¬ic Renal Insufficiency Cohort (CRIC) Study. JAMA Ophthal¬mol 2019;137:767–74.
14. Wu AY, Kong NC, de Leon FA, Pan CY, Tai TY, Yeung VT, et al. An alarmingly high prevalence of diabetic nephropathy in Asian type 2 diabetic patients: the MicroAlbuminuria Prevalence (MAP) Study. Diabetologia 2005;48:17–26.
15. El-Asrar AM, Al-Rubeaan KA, Al-Amro SA, Moharram OA, Kangave D. Retinopathy as a predictor of other diabetic compli¬cations. Int Ophthalmol 2001;24:1–11.
16. Seyed AR, Neda M, Mohammad SM, High levels of FBS and HbA1c and their association with diabetic retinopathy: a study in the north of Iran. J Diabetes Metab Disord. 2022 Jun; 21(1): 399–406.
17. Matuszewski W, Stefanowicz-Rutkowska MM, Szychlińska M, Bandurska- Stankiewicz E. Differences in Risk Factors for Diabetic Retinopathy in Type 1 and Type 2 Diabetes Mellitus Patients in North-East Poland. Medicina. 2020 Apr 14;56(4):177-81.

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