Section: Ophthalmology

Original Research Article

PREVALENCE AND SEVERITY OF RETINOPATHY AMONG NON-DIABETIC CHRONIC KIDNEY DISEASE PATIENTS

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Abstract

Background: The Prevalence of retinopathy has drastically increased in recent years even in non-diabetic chronic kidney disease patients with uncontrolled hypertension. Aim and Objectives: To determine the prevalence of retinopathy among non diabetic chronic kidney disease patients. To correlate the severity of retinopathy with microalbuminuria and eGFR(estimated glomerular filtration rate). To assess the retinopathy findings among hemodialysis and medical management groups. **Materials and Methods:** 156 cases of non-diabetic chronic kidney disease patients with hypertension were studied. All patients were subjected to detailed history, ocular examination, fundus photography, blood investigations and urine analysis to evaluate the renal parameters. Grading of retinopathy was done using Keith-Wagener classification and all the parameters were assessed. **Result:** Nearly two third patients were found to have retinopathy changes of varying grades. The severity of retinopathy among medical management group of patients were less compared to hemodialysis group of patients. Microalbuminuria and decreased eGFR has strong correlation with increasing grades of retinopathy. **Conclusion:** Prevalence and severity of retinopathy strongly correlates with the severity of renal disease based on renal parameters like reduction of eGFR and increased microalbuminuria.

INTRODUCTION

Hypertension is the major risk factor for cardiovascular events and mortality all over the world.[1] Elevated blood pressure can cause wide variety of pathophysiological changes in the retinal, choroidal and systemic circulation. Retinal microvasculature provides an exceptional opportunity for non- invasive visualization of human circulation in vivo thereby serves as one of the best modality to assess the systemic microcirculation status.[2] Hypertensive retinopathy signifies widespread microvascular damage in eye due to elevated blood pressure, which in-turn significantly associated with renal function.[3] Renal parameters like creatinine, microalbuminuria and eGFR are important indicators of renal function which aids in early diagnosis of renal disease.[4] More advanced structural damage were reported to be seen in patients with microalbuminuria.[5,6] The rate of progression of microalbuminuria also increased by uncontrolled hypertension.[7] In this study, retinopathy in non-diabetic chronic kidney disease patients and its correlation with renal parameters will is dealt in detail.

MATERIALS AND METHODS

This study was carried out on patients who have attended nephrology outpatient department, hemodialysis unit and ophthalmology outpatient department in dhanalakshmi Srinivasan Medical College and Hospital, Perambalur during the period of April 2021 to April 2022. This is a descriptive cross sectional study done in non-diabetic chronic kidney disease patients with hypertension. All patients of chronic kidney disease were subjected to detailed history taking, complete clinical examination including visual acuity testing, complete anterior segment examination using slit lamp and intraocular pressure measurement. After initial examination of anterior segment, all patients were subjected for dilatation using 1% tropicamide eye drops. This is followed by the examination of fundus using indirect ophthalmoscope with 20D lens and retinal photographs using fundus camera. After a thorough retinal examination, retinopathy was graded based on Keith-Wagner classification of hypertensive retinopathy. Based on the grades of retinopathy, patients were advised regular screening and appropriate management for retinopathy. These

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patients were also advised to undergo blood investigations to evaluate blood sugar, HbA1c, serum uric acid, serum urea, creatinine, eGFR and other renal parameters like microalbiminuria. The collected data were analyzed using SPSS statistics software. The probability value of <0.05 is considered significant.

RESULTS

Out of 156 patients, 75 were on medical management and 81 patients were on hemodialysis. Average mean age in years found to be 53.3±13.3. No significant differences in age group, sex, smoking status, intraocular pressure and anterior segment evaluation. Mean best corrected visual acuity is equal to logMAR:0.130±0.50, Snellen equivalent 20/25 to 20/80. The uncorrected visual acuity (UCVA) of 77.6% of patients were >6/18 and 7.1% had <6/60, whereas the best corrected visual acuity (BCVA) of 87.8% of patients were >6/18, 10.9% had visual acuity between 6/60 and 6/24 and 1.3% had <6/60. Mean age of patients participated in our study was 51 years . Of 156 patients participated, 60.95% were males and 39.1% were females. Among 156 patients with non diabetic chronic kidney disease, 75 were on medical management and 81 were on hemodialysis. The mean intraocular pressure (IOP) of the patients was 15.6 mmHg. About 43.6% patients had no lens changes, 23.7 were pseudophakic, 17.3 had posterior subcapsular cataract and 14.7% had senile immature cataract with varying grades of nuclear sclerosis and one patient found to have shallow anterior chamber with Van Herick grade 1.

Fundus examination revealed no retinopathy changes in 7.7% patients, 12.8% had grade 1 hypertensive retinopathy, 41.7% had grade 2 hypertensive retinopathy, 35.95% had grade 3 hypertensive retinopathy and 1.9% had grade 4 hypertensive retinopathy.

The mean serum urea level among the participants was 112.7. The mean serum creatinine of the participants was 8.9. The mean serum uric acid of the participants was 10.4. The HbA1C of the patients were less than 6. The mean eGFR of the patients participated in this study was 8. Among 156 patients participated, 16% had no albumin in urine, 22.4% had 1+ albumin, 41% had 2+ albumin, 20.5% had 3+ albumin in urine. Among patients with urine albumin 1+, about 14% had no retinopathy, 20% had grade 1 retinopathy, 45.7% had grade 2 retinopathy, 7.1% had grade 3 retinopathy, 2.9% had grade 4 retinopathy. Among urine albumin 2+ patients, 1.6% had no retinopathy, 4.7% had grade 1 retinopathy, 48.4% had grade 2 retinopathy, 41.3% had grade 3 retinopathy, 4.9% had grade 4 retinopathy. Among urine albumin 3+ patients, 31.3% had grade 2 retinopathy, 50.3% had grade 3 retinopathy, 12.9% had grade 4 retinopathy. About 97.4% had no traces of sugar in urine and 2.6% had few traces of sugar in urine.

Based on eGFR values of the participants in our study, it has been found that patients with eGFR value of about 15 ± 1 had no retinopathy changes, 10 ± 1 had grade 1 retinopathy, 8 ± 1 had grade 2 retinopathy, 5 ± 1 had grade 3 retinopathy and those with values less than 5 had grade 4 retinopathy [Table 1 and Figure 1]. Serum creatinine which directly influences the eGFR value was compared with the different grades of retinopathy. Patients presented with serum creatinine of less than 5 had no retinopathy changes, those with 5-10 values had grade 1 to 2 retinopathy changes, more than 10 had grade 3 and 4 retinopathy changes [Table 2 and Figure 2].

Based on the amount of albumin excreted in urine, patients with 1+ urine albumin predominantly had grade 1 and grade 2 retinopathy whereas patients with 2+ and 3+ urine albumin predominantly had grade 3 and grade 4 retinopathy [Table 3 Figure 3]. The prevalence of retinopathy was found to be 92.3%.

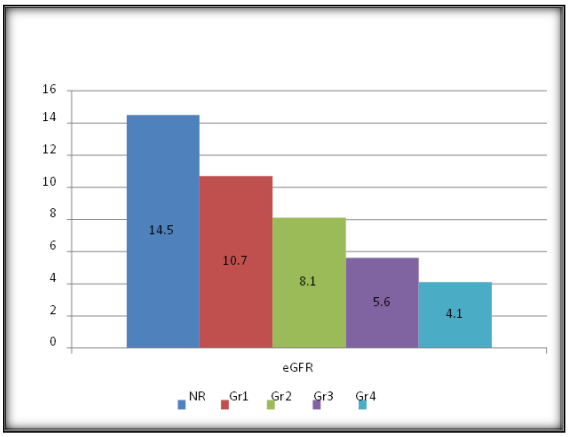

Figure 1: Association between different grades of retinopathy and eGFR

NR - No Retinopathy, Gr1 - Grade 1 Retinopathy, Gr2 - Grade 2 Retinopathy, Gr3 - Grade 3 Retinopathy, Gr4 - Grade 4 Retinopathy

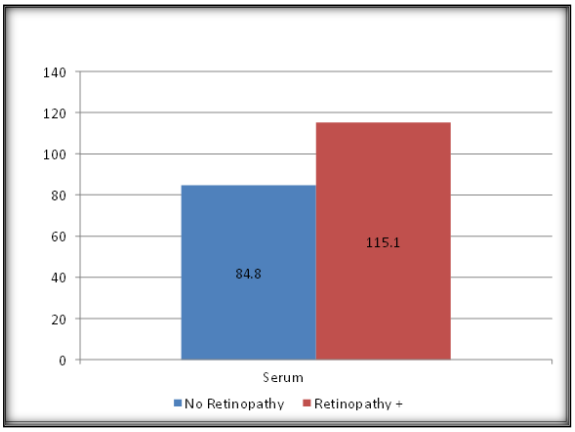

Figure 2: Association between serum creatinine presence of retinopathy

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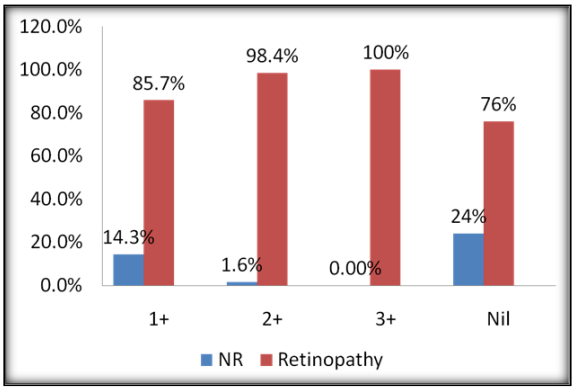

Figure 3: Association between presence of retinopathy and Urine albumin

Table 1: Association between different grades of retinopathy and eGFR

S. No	Characteristics	No Retinopathy	Grade 1 Retinopathy	Grade 2 Retinopathy	Grade4 Retinopathy	p value
1	eGFR	14.5	10.7	8.1	4.1	<0.001

Table 2: Association between presence of retinopathy and serum creatinine (mean)

S. No	Characteristics	No Retinopathy	Retinopathy	p value
1	Serum creatinine	84.8	115.1	0.005
p <0.05 indicates there is a statistical significant difference in the serum creatinine among presence of retinopathy (t test test)				

Table 3: Association between presence of retinopathy and Urine albumin

S. No	Characteristics	NR	Retinopathy	Retinopathy	p value
1	Urine albumin	1+	5 (14.3%)	30 (85.7%)	
		2+	1 (1.6%)	63 (98.4%)	
		3+	0 (0%)	32 (100%)	
		Nil	6 (24%)	19 (76%)	
p <0.05 indicates there is a statistical significant difference in the urine albumin among presence of retinopathy (Fischer exact test)					

DISCUSSION

Systemic hypertension is considered as a multi-system disorder which affects kidney, heart, brain, large arteries as well as eyes. Hypertension mainly affects the vasculature of eye in terms of both structure and function. Ocular manifestations of hypertension occurs due to alteration in the vasculature of retina, choroid and optic nerve circulations. The most common ocular manifestation of hypertension is retinopathy which occurs due to acute and chronic elevations in blood pressure. The important pathophysiology of hypertension in microvasculature includes vasoconstriction, sclerosis and exudation due to disruption in blood-brain barrier. The changes in retinal microcirculation is an useful indicator in identifying persons at risk of developing renal function deterioration. Hypertensive retinopathy signs are associated with several subclinical atherosclerotic diseases such as coronary artery calcification, aortic stiffness, left ventricular hypertrophy and carotid intima-media thickness. A large multicentric US study, reported that otherwise healthy patients with moderate hypertensive retinopathy signs have more likelihood of developing cerebral infarction, cerebral white matter lesions, cerebral atrophy and cerebral microbleeds compared to those without these signs.[8-10]

Chronic Kidney Disease (CKD) has become a major public health issue which leads to serious life threatening outcomes. Elevated serum creatinine and urea is found to be strongly associated with increasing grades of retinopathy. Microalbuminuria is one another important indicator of renal function and retinopathy. Estimated Glomerular Filtration Rate (eGFR) is the measure of renal function, which directly indicates the extent of renal damage and stage of chronic kidney disease. Presence of retinopathy in non-diabetic kidney disease is associated with increased risk of development of other microvascular damages like stroke, myocardial infarction. Thus, a well controlled hypertension reduces the progression of renal damage which in-turn halts the progression of retinopathy.

CONCLUSION

The prevalence of retinopathy among non diabetic chronic kidney disease patients was found to be 92.3%. Patients with early stages of chronic kidney disease found to have less severe grades of retinopathy than patients in later stages of chronic kidney disease. The severity of retinopathy among medical management group of patients is less severe than the hemodialysis group of patients. Serum urea and creatinine levels were found to have a significant positive association with the severity of retinopathy, whereas serum uric acid has no significant association with retinopathy. The eGFR and microalbiminuria is found to have strong association with severity of retinopathy. The rise in

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microalbiminuria and reduction in eGFR value increases the severity of retinopathy. This concludes that increasing severity of retinopathy is associated with increasing severity of chronic kidney disease.

REFERENCES

1. Anothaisintawee T, Rattanasiri S, Ingsathit A, Attia J, Thakkinstian A. Prevalence of chronic kidney disease: a systematic review and meta-analysis. Clinical nephrology. 2009 Mar 1;71(3):244.
2. Ikram MK, Witteman JC, Vingerling JR, Breteler MM, Hofman A, de Jong PT. Retinal vessel diameters and risk of hypertension: the Rotterdam Study. hypertension. 2006 Feb 1;47(2):189-94.
3. Edwards MS, Wilson DB, Craven TE, Stafford J, Fried LF, Wong TY, Klein R, Burke GL, Hansen KJ. Associations between retinal microvascular abnormalities and declining renal function in the elderly population: the Cardiovascular Health Study. American journal of kidney diseases. 2005 Aug 1;46(2):214-24.
4. Mogensen CE, editor. The kidney and hypertension in diabetes mellitus. Springer; 2013 Dec 21.
5. Brocco E, Fioretto P, Mauer M, Saller A, Carraro A, Frigato F, Chiesura-Corona M, Bianchi L, Baggio B, Maioli M, Abaterusso C. Renal structure and function in non-insulin dependent diabetic patients with microalbuminuria. Kidney international Supplement. 1997 Dec 2(63).
6. Østerby R. Lessons from kidney biopsies. Diabetes/metabolism reviews. 1996 Oct;12(3):151-74.
7. Christensen CK, Mogensen CE. The course of incipient diabetic nephropathy: studies of albumin excretion and blood pressure. Diabetic Medicine. 1985 Mar;2(2):97-102.
8. Cheung N, Mosley T, Islam A, Kawasaki R, Sharrett AR, Klein R, Coker LH, Knopman DS, Shibata DK, Catellier D, Wong TY. Retinal microvascular abnormalities and subclinical magnetic resonance imaging brain infarct: a prospective study. Brain. 2010 Jul 1;133(7):1987-93.
9. Hilal S, Ong YT, Cheung CY, Tan CS, Venketasubramanian N, Niessen WJ, Vrooman H, Anuar AR, Chew M, Chen C, Wong TY. Microvascular network alterations in retina of subjects with cerebral small vessel disease. Neuroscience letters. 2014 Aug 8;577:95- 100.
10. Kawasaki R, Cheung N, Mosley T, Islam AF, Sharrett AR, Klein R, Coker LH, Knopman DS, Shibata DK, Catellier D, Wong TY. Retinal microvascular signs and 10-year risk of cerebral atrophy: the Atherosclerosis Risk in Communities (ARIC) study. Stroke. 2010 Aug 1;41(8):1826-8.

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