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Assessment of Hypertensive Retinopathy Signs as Risk Indicators of Cardiovascular Morbidity and Mortality

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Abstract

Background: To assess hypertensive retinopathy signs as risk indicators of cardiovascular morbidity and mortality. **Material and Methods:** Eighty patients of hypertension of either gender was included. Blood pressure was measured using palpatory method. Eye examination was carried by an expert eye surgeon. Stereoscopic 30° color fundus photographs centered on the disc and macula and a nonstereoscopic color fundus photograph temporal were taken in each eye. **Results:** Out of 80 patients, males were 38 and females were 42. Out of 80 patients, hypertensive retinopathy was seen in 30 patients as grade 1 in 12, grade 2 in 9, grade 3 in 5 and grade 4 in 4 cases. The difference was significant ($P< 0.05$). It was shown that 1 patient of hypertensive retinopathy of grade 3 and 4 each developed stroke and 1 patient of grade 2 and 3 and 2 patients of grade 4 developed ischaemic heart disease at 1 year follow up. Cardiovascular morbidity increases with increasing grade ($P> 0.05$). **Conclusion:** We have noticed as per results that as the grade of hypertensive retinopathy increases the chances of stroke & ischaemic heart disease increases.

Keywords: Systemic arterial hypertension, Retinopathy, hemorrhages.

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Introduction

Systemic arterial hypertension is a major public health problem and a treatable risk factor for different systemic conditions responsible for serious morbidity and mortality.[1] World Health Organization (WHO), in the adult population, defines hypertension as a systolic pressure greater than 140 mm Hg and/or a diastolic pressure greater than 90 mm Hg. The WHO estimates that 1.13 billion people worldwide have hypertension and fewer than 1 in 5 people with hypertension have it under control. With advances in medical technology, the life expectancy continues to extend, and the number of patients with high blood pressure has increased.[2]

The significance of hypertensive retinopathy signs as risk indicators of systemic morbidity and mortality has long been recognized since their description in patients with renal and cerebrovascular disease.[3] Mild hypertensive retinopathy signs, such as generalized and focal retinal arteriolar narrowing and arteriovenous nicking, are weakly associated with systemic vascular diseases.[4] Moderate hypertensive retinopathy signs, such as isolated microaneurysms, haemorrhages and cotton-wool spots, are strongly associated with subclinical cerebrovascular disease and predict incident clinical stroke, congestive heart failure and cardiovascular mortality, independent of blood pressure and other traditional risk factors.[5] Considering this, we attempted present study to assess hypertensive retinopathy signs as risk indicators of cardiovascular morbidity and mortality.

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Material and Methods

After considering the utility of the study and obtaining approval from ethical review committee of the institute, we selected eighty patients of systemic hypertension of either gender. All gave their written consent. Inclusion criteria were patients with SBP >150 mm Hg and DBP >90 mm Hg of either gender, age ranged 30-70 years and those giving written consent. Exclusion criteria were diabetic patients and patients with combined diabetes mellitus and hypertension and those not willing to participate in the study. Patients with already existing cerebrovascular comorbidity were also excluded from the study.

Demographic data was recorded. A thorough physical and systemic examination was performed. Blood pressure was measured using palpatory method. Eye examination was carried by an expert eye surgeon. Stereoscopic 30° color fundus photographs centered on the disc and macula and a nonstereoscopic color fundus photograph temporal were taken in each eye. The hypertensive retinopathy were recorded as- grade 1 generalized arteriolar narrowing, grade 2 focal arteriolar narrowing & accentuation of light reflex with AV crossing changes later is hallmark of hypertensive retinopathy, grade 3 flame shaped hemorrhages, cotton wool spots & hard exudates and grade 4 is grade 3 + papilloedema was recorded. All patients were followed up for 1 year. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table 1: Patients distribution

Total- 80		
Gender	**Male**	**Female**
Number	38	42

Out of 80 patients, males comprise 38 and females 42 [Table 1].

Table 2: Assessment of hypertensive retinopathy cases

Retinopathy	**Number**	**P value**
Grade 1	12	0.032
Grade 2	9	
Grade 3	5	
Grade 4	4	

Out of 80 patients, hypertensive retinopathy was seen in 30 patients as grade 1 in 12, grade 2 in 9, grade 3 in 5 and grade 4 in 4 cases. The difference was significant (P< 0.05) [Table 2, Graph 1].

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Graph 1

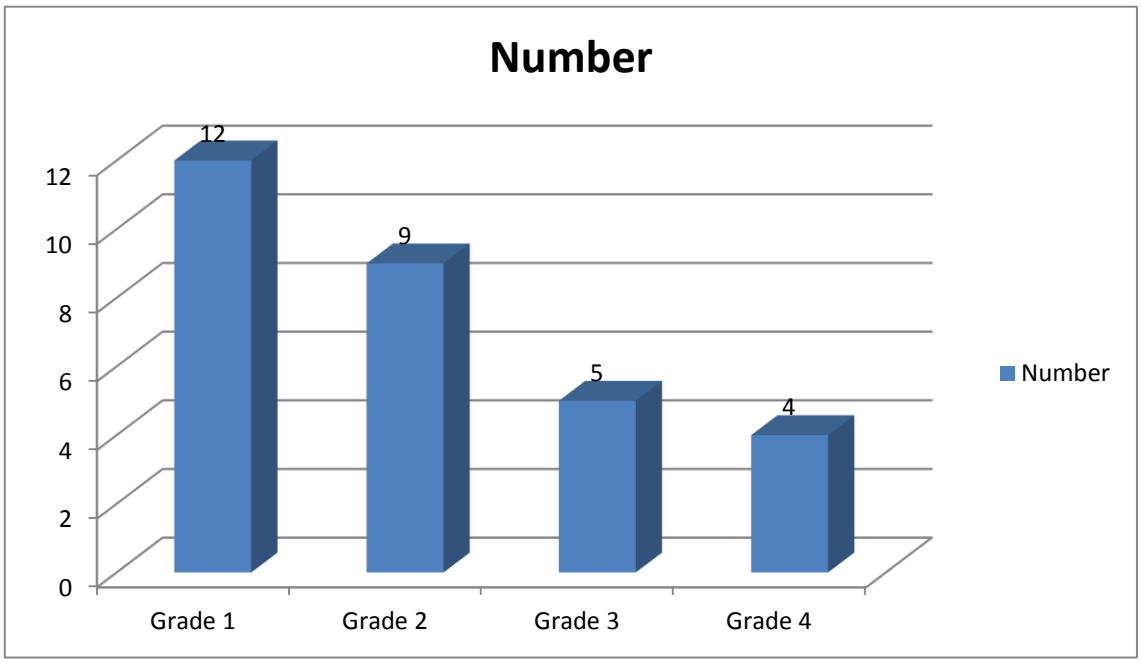

Table 3 Cardiovascular morbidity at 1 year follow up

Grade	Stroke	Ischaemic heart disease	P value
Grade 1	0	0	0
Grade 2	0	1	0.52
Grade 3	1	1	1
Grade 4	1	2	1

It was seen that 1 patient of hypertensive retinopathy of grade 3 and 4 each developed stroke and 1 patient of grade 2 and 3 and 2 patients of grade 4 developed ischaemic heart disease at 1 year follow up. Cardiovascular morbidity increases with increasing grade (P> 0.05) [Table 3].

DISCUSSION

Hypertension is a well-known risk factor for other diseases, called hypertension-mediated organ damage (HMOD), such as stroke, disability, myocardial infarction, heart failure, kidney failure and early death.[6] Hypertension affects the eyes through a series of pathophysiological modifications that can damage the retinal, choroidal, and optic nerve circulations causing respectively retinopathy, choroidopathy, and optic neuropathy. The most common ocular manifestation of high blood pressure is hypertensive retinopathy (HR).[7,8] Hypertensive retinopathy signs have been linked with both subclinical and clinical coronary heart disease and congestive heart failure. For example, various hypertensive retinopathy signs have been associated with ischaemic changes on electrocardiogram, severity of coronary artery stenosis on angiography and incident coronary heart disease and myocardial infarction in men and women.[9,10] Considering this, we attempted present study to assess hypertensive retinopathy signs as risk indicators of cardiovascular morbidity and mortality.

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The present study comprises 80 patients, off which males were 38 and females 42. Klein et al,[11] investigated the relationship of systemic hypertension to the incidence of various retinal vascular lesions. Among those examined, 2,151 (69.1%) were normotensive and 963 (30.9%) were hypertensive at baseline. Over the five-year period, retinopathy developed in 175 (6.0%), arteriolar narrowing in 282 (9.9%) and arterio-venous nicking in 201 (6.5%) nondiabetic subjects. After adjusting for age, hypertension was associated with the incidence of retinopathy (in men: relative risk [RR] 2.31, 95% confidence interval [CI] 1.54 to 3.48; in women: RR 1.61, 95% CI 1.07 to 2.43) and with arteriolar narrowing (in men: RR 1.82, 95% CI 1.25 to 2.66; in women: RR 1.36, 95% CI 1.05 to 1.77), but not with arterio-venous nicking (in men: RR 1.01, 95% CI 0.69 to 1.48; in women: RR 1.37, 95% CI 0.95 to 1.97). The five-year incidence of retinopathy and of arteriolar narrowing was higher in those subjects whose blood pressure was elevated despite use of antihypertensive medications compared with those subjects whose blood pressure was controlled with antihypertensive medications or those who were normotensive.

Out of 80 patients, hypertensive retinopathy was seen in 30 patients as grade 1 in 12, grade 2 in 9, grade 3 in 5 and grade 4 in 4 cases. Marco et al,[12] found that HR signs have a significative association with cardiovascular, cerebrovascular and other systemic diseases. Patients with arteriosclerotic changes and, at the same time, severe HR, are at increased risk for coronary disease, peripheral vascular disease, stroke and dementia. HR is even now diagnosed and classified by its clinical appearance on a fundoscopic exam that is limited by interobserver variability. New technologies, like OCT, OCTA, AO and artificial intelligence may be used to develop a new instrumental classification that could become an objective and quantitative method for the evaluation of this disease. They could be useful to evaluate the subclinical retinal microvascular changes due to hypertension that may reflect the involvement of other vital organs.

It was seen that 1 patient of hypertensive retinopathy of grade 3 and 4 each developed stroke and 1 patient of grade 2 and 3 and 2 patients of grade 4 developed ischaemic heart disease at 1 year follow up. Kawasaki et al,[13] described the prevalence of retinal vascular signs and their association with cardiovascular risk factors in adult persons aged 35 years or older. Moderate or severe focal arteriolar narrowing, arteriovenous nicking, enhanced arteriolar wall reflex, and retinopathy were found in 8.3%, 15.2%, 18.7%, and 9.0%, respectively, of the study population. Mean (+/-standard error) values for retinal arteriolar diameter were 178.6+/-21.0 mum, and mean values (+/-standard error) for venular diameter were 214.9+/-20.6 mum. Older persons were more likely to have retinal arteriolar wall signs, retinopathy, and narrower retinal vessel diameters. After adjusting for multiple factors, each 10-mm Hg increase in mean arterial blood pressure was associated with a 20% to 40% increased likelihood of retinal arteriolar signs and a 2.8-mum reduction in arteriolar diameter. Retinopathy was associated with higher body mass index and both impaired glucose tolerance and impaired fasting glucose.

CONCLUSION

We have noticed as per results that as the grade of hypertensive retinopathy increases the chances of stroke & ischaemic heart disease increases.

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