



ORIGINAL RESEARCH PAPER

Ophthalmology

DIABETES AND HYPERTENSION - A COMBO FOR DIABETIC RETINAL VASCULAR CHANGES

KEY WORDS: Diabetes, Hypertension. Vascular changes in diabetes and hypertension

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ABSTRACT

Aim: To study the impact of systemic hypertension on diabetic retinopathy and maculopathy.
Materials and methods: This was a bidirectional cohort observational study conducted on 100 patients. Informed consent was obtained. Detailed history regarding the age, duration of diabetes, family history of hypertension was recorded. Fundus fluorescein angiography was done after pupillary dilatation. Staging of diabetic retinopathy and grading of diabetic maculopathy were done.
Results: 39.17% of diabetic retinopathy and 43.41% of maculopathy patients had hypertension at presentation. There was statistically significant association of family history with incidence of macular edema in our study. Hypertension had significant correlation with progression of DR. Uncontrolled diastolic BP rather than systolic BP had significant association with development of macular edema in the follow up period. Retinal venous dilatation is an important indicator of ischaemic maculopathy.
Conclusion: Lifestyle modification, early diagnosis and treatment of both diabetes and hypertension, regular follow-up and fundus examination may favour best clinical and visual outcomes in these patients.

Introduction:

Hypertension is common in 30% of people with younger onset diabetes mellitus and 75% with older onset diabetes mellitus¹. There is a two-fold increase in hypertension in diabetic patients regardless of gender². Patients with hypertension are more likely to develop progressive severe levels of DR^{3,4,5}. Diabetic patients with concomitant hypertension are at 3 times risk of developing diffuse macular edema⁶.

High blood glucose level in diabetics leads to impairment of retinal blood flow autoregulation at levels of raised mean arterial pressure⁷. Hypertension enhances endothelial damage in the retinal vasculature⁸. Vascular stretch of the retinal endothelium increases expression of vascular endothelial growth factor and its receptors which accounts for progression of both diabetic and hypertensive retinopathy⁹.

MATERIALS AND METHODS:

This was a bidirectional cohort observational study conducted with 100 patients in Ophthalmology OPD at a tertiary care hospital from October 2013- September 2015. The study was registered and ethical committee approval was obtained.

Inclusion criteria: Patients with diabetic retinopathy atleast in one eye

Exclusion criteria: i) Patients already on treatment for systemic hypertension ii) Narrow angles iii) Media opacities iv) Patients already treated for diabetic retinopathy.

Informed consent was obtained. Detailed history regarding age, duration of diabetes, family history of hypertension was recorded. Fundus fluorescein angiography was done after pupillary dilatation. Staging of diabetic retinopathy and grading of diabetic maculopathy were done. The patients were followed up for 2 years and the results were statistically analysed.

RESULTS: Out of 100 patients, 68 were males and 32 were females. Mean age was 57.21 years and ranged from 41-73 years.

Table 1 Hypertension and stage of DR

Hypertension	DR stage							Total	%
	Mild NPD R	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	9	36	15	0	8	5	3	76	39.17%
No	16	24	24	4	27	15	8	118	60.82%
Total	25	60	39	4	35	20	11	194	100%

Kendall's tau test Correlation coefficient 0.213. P value 0.001
 Hypertension had significant weak correlation with progression of DR.

Table 2 Hypertension and grading of maculopathy

Hypertension	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	18	35	1	2	56	43.42%	0.21
No	18	47	5	3	73	56.58%	
Total	36	82	6	5	129	100%	

*Pearson's chi square test
 Hypertension had no significant association with grading of maculopathy.

Table 3 Retinal vascular changes and diabetic maculopathy

Retinal AV ratio	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
2:3	27	47	3	0	77	59.69%	0.010
1:3	0	4	0	3	7	5.43%	
1:4	5	3	0	1	9	6.97%	
2:4	4	28	3	1	36	27.91%	
Total	36	82	6	5	129	100%	

A: V ratio had significant association with grading of maculopathy.

DISCUSSION:

American diabetes association has suggested target for systolic and diastolic blood pressure level as <130mm of Hg and <85 mm of Hg respectively¹⁰. UKPDS study stated that control of systemic hypertension reduced the risk of new onset DR and slow the progression of existing DR. With tight blood pressure control, 35% risk reduction for the need for retinal photocoagulation, 4% risk reduction for progression of retinopathy, 34% risk increase for the

need for cataract extraction, 24% risk reduction for the development of vitreous haemorrhage and 29% risk reduction for the development of legal blindness¹¹.

WESDR study concluded that diastolic blood pressure was a significant predictor of progression of DR3. Diastolic blood pressure was associated with a 220% increased risk of developing macular edema with older onset of diabetes mellitus¹². In 1957, **Kornerup** in his study concluded that raised blood pressure is by no means an essential factor in the etiology of DR¹³. **Rand** in 1984 found that more patients with PDR were on antihypertensive therapy than without retinopathy¹⁴. **Murphy** in 1984 found that retinopathy progressed more rapidly in patients with systemic hypertension than in those without it¹⁵. **John M. Sparrow** in his study concluded that high blood pressure and the use of antihypertensive drugs were risk factors for retinopathy and maculopathy¹⁶.

In our study, among the 100 patients recruited, 194 eyes had diabetic retinopathy and 38 patients had concurrent hypertension. 39.17% of DR patients had hypertension at presentation which was comparable with Klein R et al study. Family history of hypertension was reported by 14 patients which contributed to 7.22% of the DR eyes. There was statistically significant association of family history with incidence of macular edema in our study (p value 0.039).

The mean systolic and diastolic blood pressure were 129 and 81 mm of Hg respectively. Hypertension had significant weak correlation with progression of DR (p value 0.001) which was comparable to UKPDS study. 43.41% of maculopathy patients had hypertension at presentation and there was no significant association of hypertension with maculopathy (P value 0.21). However, uncontrolled diastolic BP rather than systolic BP had significant association with development of macular edema in the follow up period (p value 0.002) which was comparable to Klein R study.

56.58% had hypertensive retinopathy in patients with DR and hypertension. None of our study population had grade 3 or grade 4 hypertensive retinopathy. This may be explained by selection bias. Hypertensive retinopathy grading had no correlation with progression of DR (P value 0.885) and no association with maculopathy (P value 0.134).

Normal A: V ratio (2:3) was found in 59.69% of patients, arteriolar narrowing with normal venous calibre was found in 5.43%, both arteriolar narrowing and venous dilatation was found in 6.97% and only venous dilatation was found in 27.91%. Venous dilatation was found to be more common with maculopathy and the P value was significant (0.010). Retinal venous dilatation is an important indicator of ischaemic maculopathy in our study.

CONCLUSION:

Lifestyle modification, early diagnosis and treatment of both diabetes and hypertension, regular follow- up and fundus examination may favour best clinical and visual outcomes in these patients.

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