

Prevalence of retinopathy in hypertensive patients

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ABSTRACT

Objectives: To determine the prevalence of retinopathy in hypertensive patients referred to a teaching hospital in Yazd, Iran.

Methods: This cross-sectional study included 213 hypertensive patients referring to a teaching hospital in Yazd, Iran between November 2004 and June 2005. Data were collected using a questionnaire after an interview and ocular examination. Demographic variables, hypertensive retinopathy, familial history of hypertension, duration of diagnosis, and other hypertension side effects such as cardiac, renal, cerebro-vascular complications were analyzed. The Scheie's staging system was used for retinopathy grading.

Results: A total of 213 patients (95 men, 118 women) with high blood pressure aged between 25 and 85 years (mean age of 64.47 ± 10.66 years) were enrolled in this study,

wherein 39.9% of patients suffered from retinopathy. This rate was higher in women (45.6%) than in men (33%). The positive familial history of hypertension was reported in 47.8% of patients. The prevalence rate of retinopathy in patients suffering from mild hypertension was 25.3%, moderate hypertension was 34.5% and severe hypertension 84.6%. Of the patients with retinopathy, 42.36% had grade I, 20% had grade II and 2.35% had grade III retinopathy. The most common ophthalmoscopic findings were arteriolar narrowing (35.13%), arterio-venous nicking (17.12%) and cotton wool patches (9%).

Conclusion: Positive family history of hypertension and target organs involvement are important risk factors for retinopathy. Early diagnosis and treatment of hypertension to prevent complications is essential.

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Even with the many advances in the treatment of high blood pressure (HBP), the cause remains idiopathic in 90-95% of the cases. Familial involvement in primary hypertension is common and represents genetic causes.^{1,2} In addition, hypertension is a nutritional health disease and many risk factors are involved such as chronic excessive calories and salt intake, obesity, alcohol consumption, sedentary lifestyle and psycho-social stress.^{2,3}

High blood pressure, especially systolic type is related with many clinical complications such as stroke, cardiac failure, myocardial infarction, renal

failure, peripheral vascular diseases, retinopathy and premature death.^{4,8} Some ophthalmoscopic findings are helpful in evaluating the duration, severity, predictions or hypertension vasculopathy effects.⁹ Even though routine ophthalmoscopy is advocated in hypertensive patients, its use as a predictor of retinopathy is unknown.¹⁰ Retinal microvascular changes are signs of hypertensive retinopathy and can be useful to classify risk factors and treatment decisions for hypertension.¹¹

In 1939, Keith, Wagner and Barker presented a classification system for hypertensive retinopathy.¹²

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Table 1 - Frequency of retinopathy in patients according to their age.

Group	No. of patients (%)			
	25-59 years	60-64 years	65-69 years	≥70 years
With retinopathy	22 (45.8)	15 (32.6)	17 (38.6)	31 (40.3)
Without retinopathy	26 (54.2)	31 (67.4)	27 (61.4)	46 (59.7)
Total	48 (100)	46(100)	44(100)	77(100)

Table 2 - Frequency of retinopathy according to family history of hypertension.

Group	Number (%)	
	Positive family history	Negative family history
With retinopathy	54 (47.8)	31 (31)
Without retinopathy	59 (52.2)	69 (69)
Total	113 (100)	100(100)

Scheie classification was introduced in 1953.¹³ The clinical importance of cardiovascular risk factors staging in hypertensive patients is based on retinopathy changes.¹⁴ Eyes are proven hypertensive target organs.¹⁵ Based on high rate of HBP and the importance of retinopathy in the management of hypertension, we conducted this study.

Methods. This cross-sectional study included 213 hypertensive patients referred to teaching hospitals of Yazd, Iran between November 2004 and June 2005. The sampling method was simple, example consecutive enrollment of cases till the completion number was achieved.

Data were collected using a questionnaire after an interview and ocular examination. The interview was carried out by medical interns, whereas cardiovascular and ocular examination by cardiologist and ophthalmologist, respectively. Demographic variables, hypertensive retinopathy, type of hypertension, and other hypertensive side effects such as cardiac, renal, cerebral and vascular complications were analyzed. Statistical analysis was made using Chi-square, Fisher exact test and t-test.

Normal blood pressure was defined as systolic blood pressure <130 mmHg and diastolic blood pressure <85 mmHg. Systolic and diastolic blood pressure of mild HBP was defined as 140-159/90-99 mmHg, moderate HBP as 160-179/100-109 mmHg and severe HBP as ≥180/ ≥110 mmHg. The Scheie's staging system was used for retinopathy grading.

Results. Of the 213 patients (95 men and 118 women) aged between 25 and 85 years with mean age of 64.47 ± 10.26 years, 85 cases (39.9%) had retinopathy. Based on HBP severity, 22 of 85 patients have mild HBP (25.3%), 30 of 87 have moderate (36.5%) and 33 of 39 have severe HBP cases (84.6%) had retinopathies ($p=0.000$).

The prevalence of mild HBP was 40.8% (87 cases), moderate HBP was 40.8% (87 cases) and

severe HBP was 18.3% (39 cases). Retinopathy has a direct relationship with the severity of hypertension, so a small percentage of severe HBP cases did not show retinopathy. The ratio of retinopathies in men to women was 32.6%:45.8% ($p=0.048$). Thus, the prevalence of retinopathy in women was 1.4 times more than that in men. In general, 39.9% of cases had retinopathy, 42.4% was grade I, 35.3% grade II, 20% grade III and 2.3% had grade IV of retinopathy.

The period of HBP diagnosis in patients was between 15 days and 30 years (mean of 7.82 ± 6.29 years). The period of taking anti-hypertensive medication was between one month and 18 years (mean of 5.9 ± 4 years) in patients without retinopathy and between 15 days and 26 years (mean of 9.3 ± 6.6 years) in patients with retinopathy, ($p=0.000$).

According to age, the cases were divided into 4 groups; I (25-59 years), II (60-64 years), III (65-69 years) and IV (>70 years). Retinopathy was seen most frequently in the first group (25-59 years old age group), but there was no statistically significant relationship ($p=0.521$) between the age of groups and retinopathy (**Table 1**).

The rate of retinopathy in patients with positive family history was 47.8% (54 of 113) while in negative family history cases was 31% (31 of 100). The difference was statistically significant ($p=0.013$). Thus, positive family history for HBP is a risk factor for retinopathy (**Table 2**).

The rate of retinopathy in patients with HBP side-effects of cardiac was 61.5% (40 of 65 cases), renal was 55.1% (27 of 49 cases), cerebrovascular was 82.4% (14 of 17 cases) While in patients without these complications; cardiac was 30.4% (45 of 148 cases), renal 35.4% (58 of 164 cases) and cerebrovascular 36.2% (71 of 196 cases). These differences were statistically significant ($p=0.000$ and 0.013). Generally, from 105 patients with target organ involvement (cardiac, renal and cerebrovascular) 64 patients (60.95%) had retinopathy. While in 108 patients without target organ involvement, only 21

patients (19.64%) had retinopathy. Therefore, target organ involvement can be considered as risk factors for developing retinopathy.

Discussion. Effects of systemic HBP on the posterior segment of the eye result in choroidopathy, retinopathy and edema of the optic nerve.¹⁶ Retinopathy has been described along with systemic sclerosis in patients, but it is not possible to differentiate the secondary changes due to hypertension.¹⁷ Delay in diagnosis of retinopathy can result in blindness.¹⁸ Patients with HBP are twice at risk of developing diabetes than normotensive patients.⁵ Retinopathy was present in 85% of the patients with persistent microalbuminuria as compared to 31% in patients with normal primary albuminuria.¹⁹ In this study, 23% of the cases had hypertensive nephropathy, 55% of them had retinopathy, while 25.4% of the patients without nephropathy had retinopathy.

In an Indian study,²⁰ grade II retinopathy was seen in 29.4% of patients with controlled HBP. In our study, 32.6% of men and 45.7% of women had retinopathy. This difference may be due to delay of HBP management in our cases. In a study on 350 hypertensive patients in Nigeria,²¹ more than 70% had retinopathy, which is similar to other studies in Africa. This rate is more than the retinopathy rate in our study, which was 39.9%. The rate of retinopathy in patients with uncontrolled HBP was more than this rate in controlled patients,^{22,23} but there was no relationship between the time period in the beginning of HBP and retinopathy.

In our study, the rate of retinopathy was 39.9%, the period of HBP diagnosis was between 15 days and 30 years (mean of 7.82 years) and the start period of antihypertensive drugs was between 15 days and 26 years (mean of 7.32 years). In patients with mild HBP 25.3%, with moderate HBP 34.5% and with severe HBP, 84.6% had retinopathy. There was a direct relationship between HBP severity and incidence of retinopathy.

In a population-based study in Singapore,²⁴ the prevalence rate of retinopathy was more in African-Americans than the Caucasian population (7.7% versus 4.1%). Also, it was associated with HBP and its severity. In our study, the period of HBP diagnosis in patients with retinopathy was 10.7 ± 7.5 years, while in patients without retinopathy was 6.3 ± 4.8 years. The duration of antihypertensive drug therapy in patients with retinopathy was 9.3 ± 6.6 years, while in patients without retinopathy was 5.9 ± 4 years. Thus, chances of retinopathy increase with duration of hypertension beginning. Therefore, early diagnosis and control of hypertension can reduce the rates of retinopathy considerably.

In a study in Italy¹⁴ on patients with grade I and grade II retinopathy, it was concluded that the high prevalence rate of retinal changes in untreated mild hypertensive patients shows new evidences, which cannot be seen in other target organs. In our study, the most frequent types of hypertension were mild and moderate (40.8% each one). The similarity of these 2 groups points out to the fact that hypertension has not been controlled properly in patients. The most frequent stage of retinopathy was grade I (42.36%). Also, the rate of retinopathy increased significantly by the severity of hypertension, which was 25.3% in mild, 34.5% in moderate and 84.6% in severe HBP ($p=0.000$).

In a study in Taiwan²⁵ 4 of 6 patients were diagnosed as malignant hypertensive patients by ophthalmologists, which represent the importance of funduscopy in management of malignant hypertension. In our study, 60.9% with target organ involvement had retinopathy, while only 19.4% without target organ involvement had retinopathy. Therefore, HBP target organ complications, especially cerebro-vascular involvement are considered as risk factor for retinopathy. In a study in Singapore²⁶ they show that retinal micro vascular abnormalities process is associated with HBP and is independent of atherosclerosis. In this study, 3 patients developed blindness in one eye due to ischemic optic neuropathy, which shows the critical consequences of HBP complications. In this study, positive family history of HBP, severity of hypertension, duration of the disease and target organs involvement (cerebro-vascular, cardiac and renal) are known as hypertensive retinopathy risk factors. Therefore, extra monitoring and attention is recommended in patients with these risk factors.

References

1. Kanski JJ. Retinal vascular disease, Clinical Ophthalmology. 5th Ed. Oxford: Butterworth & Heinemann; 2003. p. 495-497.
2. Gordon H. Williams. Approach to the patient with Hypertension. Braunwald E, Fauci A, Kasper D, Hauser S, Longo D, Jameson J. Harrison's Principles of Internal Medicine. Vol. 1, 15th Ed. USA: McGraw-Hill; 2001. p. 211-114.
3. Flack JM, Peters R, Shafi T, Alrefai H, Nasser SA, Crook E. Prevention of hypertension and its Complications: theoretical basis and guidelines for treatment. *J Am Soc Nephrol* 2003; 14: 596-598.
4. Soler MJ, Parrilla J, Vazquez-Gonzales S, Orfila A, Lioveras J. Accelerated arterial hypertension in a young male. *Nefrologia* 2004; 24 (suppl 3): 81-84.
5. El-Atat F, McFarlane SI, Sowers JR. Diabetes, hypertension, and cardio vascular derangements: Pathophysiology and management. *Curr Hypertens Rep* 2004; 6: 215-223.
6. Luo BP, Brown GC. Up date on the ocular manifestations of systemic arterial hypertension. *Curr Opin Ophthalmol* 2004; 15: 203-210.

7. Zou H, Zhang X, Xu X, Wang W, Li G, Ya H. An epidemiological survey of low vision and blindness of senile persons in Beixinjing blocks, Shanghai. *Zhonghua Yan Ke Za Zhi* 2002; 38: 744-746.
8. Chatterjee S, Chattopadhyay S, Hope-Ross M, Lip PL, Chattopadhyay S. Hypertension and the eye: Changing Perspectives. *J Hum Hypertens* 2002; 16: 901.
9. Sapira JD. An Internist looks at the fundus oculi. *Dis Mon* 1984; 30: 1-64.
10. Vanden Born BJ, Schlingemann RO, Hoekstra JB, Van Mont Frans GA. Routine funduscopic examination in hypertensive patients not useful. *Ned Tijdschr Geneesk* 2004; 148: 464-468.
11. Duncan BB, Wong TU, Tyroler HA, Davis CE, Fuchs FD. Hypertensive Retinopathy and incident coronary heart disease in high-risk men. *Br J Ophthalmol* 2002; 86: 1002-1006.
12. Backer RA. Hypertension and Arteriosclerosis. In: Jaeger TWE, editor. Duane's clinical ophthalmology. Vol. 3. Philadelphia, New York: JB Lippincott Company; 1995. p. 17-19.
13. Chaine G, Kohner EM. Hypertensive retinopathy. *J Fr Ophthalmol* 1983; 6: 995-1005.
14. Cuspidic, Salerno M, Salerno DE, Meani S, Valerio C, Esposito A, et al. High Prevalence of retinal vascular changes in never-treated essential hypertensive: an Inter- and intra-observer reproducibility study with non-mydriatic retinography. *Blood Press* 2004; 13: 25-30.
15. Reche M, Kube T, Wolf S, Kutschbach P. Do angiographic data support a detailed classification of hypertensive fundus changes? *J Hum Hypertens* 2002; 16: 405-410.
16. Tso MO, Janpol LM. Pathophysiology of hypertensive retinopathy. *Ophthalmology* 1982; 89: 1132-1145.
17. Peter S, Dietrich H, Wick G. Investigations for retinopathy in an avian model for systemic sclerosis. *Exp Eye Res* 2004; 79: 85-92.
18. Logan P, Eustace P, Robinson R. Hypertensive retinopathy: a cause of decreased visual acuity in children. *J Pediatr Ophthalmol Strabismus* 1992; 29: 287-289.
19. Biesenbach G, Zazgornik J. High Prevalence of hypertensive retinopathy and coronary heart disease in hypertensive patients with persistent microalbuminuria under short intensive anti hypertensive therapy. *Clin Nephrol* 1994; 41: 211-218.
20. Kulkarni V, Bhagwat N, Hakim A, Kamath S and Soneji SL. Hypertension in the elderly. *J Assoc Physicians India* 2001; 49: 873-876.
21. Ladipo GO. Hypertensive retinopathy in Nigerians. A Prospective clinical study of 350 cases. *Trop Geogr Med* 1981; 33: 311-316.
22. Klein R, Klein BE, Moss SE. The relation of systemic hypertension to changes in the retinal vasculature: The Beaver Dam eye study. *Trans Am Ophthalmol Soc* 1997; 95: 329-348.
23. Yu T, Mitchell P, Berry G, Li W, Wang JJ. Retinopathy in older persons without diabetes and its relationship to hypertension. *Arch Ophthalmol* 1998; 116: 83-88.
24. Wong TY, Klein R, Duncan BB, Nieto FJ, Klein BE, Couper DJ, et al. Racial differences in the Prevalence of hypertensive retinopathy. *Hypertension* 2003; 41: 1086-1091.
25. Chen YH, Kuo HK, Kao ML. Malignant hypertensive retinopathy-clinical and fundus manifestations in patients with new onset or acute exacerbation of chronic hypertension. *Chen Chang Gung Med J* 2003; 26: 669-677.
26. Wong TY, Klein R, Sharrett AR, Manolio TA, Hubbard LD, Marino EK, et al. The prevalence and risk factors of retinal micro vascular abnormalities in older persons; the cardiovascular health study. *Ophthalmology* 2003; 110: 658-666.